

UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

JANUARY, 1886.

MAY 1 1890
DETROIT, MICH.
PUBLIC LIBRARY,

PREPARED UNDER THE DIRECTION OF
BRIG. & BVT. MAJ. GEN'L W. B. HAZEN,
CHIEF SIGNAL OFFICER OF THE ARMY.

BY H. H. C. DUNWOODY,
1ST LIEUTENANT, 4TH ARTILLERY, U. S. A., A. S. O. AND ASSISTANT.

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WASHINGTON CITY:
SIGNAL OFFICE.
1886.

List of merchant marine steam and sailing vessels from which International Simultaneous Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of January, 1896.

Name of vessel.	Observer.	Name of vessel.	Observer.	Name of vessel.	Observer.
Albia Line.		Monarch Line—Continued.		White Cross Line—Continued.	
Br. a. s. <i>Arcton</i>	Capt. C. E. Le Gallia.	Br. a. s. <i>Egyptian Monarch</i>	Capt. W. S. Morgan.	Belg. a. s. <i>Pieter de Coninck</i>	Capt. E. Smith.
Norwegian	R. Carruthers.	Grecian Monarch	B. J. W. Bristow.	<i>White Star Line.</i>	H. Parwell.
Scandinavian	Wm. Richardson.	Lylian Monarch	Thos. C. Haggart.	Br. a. s. <i>Adriatic</i>	Geo. Durand.
Albanian	John Park.	Farman Monarch	J. Watson.	Baltic	H. Perry.
American Line.		<i>Morgan's L. & Texas R. R. & S. S. Co.</i>		Britannic	Benj. Glendell.
Lord Clive	John Kelly.	Am. s. s. <i>Chalmette</i>	Robt. B. Quick.	Celtic	C. W. Kennedy.
Union Prince	P. Urquhart.	El Dorado	J. W. Hawthorne.	Germanic	P. J. Irving.
Anchor Line.	W. J. Millburn.	Lone Star	Geo. W. Mason.	Republic	
Br. a. s. <i>Alexandria</i>		National Line.		<i>Wilson Line.</i>	
Australia	Robert Ford.	Br. a. s. <i>Canada</i>	Wm. Pearce.	Br. a. s. <i>Barry</i>	Charles Smith.
Utah	Alex. McKittrick.	Denmark	Geo. Cochran.	Bassano	W. Rea.
Colombia	A. Campbell.	Expt.	K. W. Grace.	Chicago	J. W. Jones.
Devonia	R. Th. Garvie.	England	T. F. Hawley.	Bialto	Wm. Rippeth.
Edinburgh	Hugh Young.	Erin	John Robinson.	Reberdo	Wm. Abbott.
Edinburgh	John Wilson.	France	A. D. Hadley.	<i>Wells, Ward Line.</i>	
Typhoon	James Brown.	Greece	A. J. Joffe.	Br. a. s. <i>Acton</i>	R. F. Gowing.
Anglo-Australian Steamship Company.	Geo. Mitchell.	Hevelia	John N. Higgins.	Br. a. s. <i>Miscellaneous.</i>	
Br. a. s. <i>Port Phillip</i>	Geo. Dullin.	Holland	Wm. Tyson.	Bedford	Robt. Temple.
Adria Line.		The Queen	James Sumner.	Camden	S. R. Chandler.
Br. a. s. <i>Adria</i>	J. W. Sanson.	Navigators Generala Italiana.		Craighill	W. H. Bennett.
Albano	H. R. Hughes.	Br. a. s. <i>Archimede</i>	Domenico Viola.	Cranbrook	John W. Harvey.
Andes	David Williams.	Gottardo	G. Diliberto.	Edith Godden	John H. Bennett.
Antillas	D. de Améaga.	New York and Cuba Mail S. S. Co.		El Callao	Thos. Scholtz.
Caribbea	H. Moran.	Am. s. s. <i>Cienfuegos</i>	C. M. Faircloth.	Elbow	Thos. Robertson.
<i>Boat's R. S. Co. (London).</i>	T. M. McKnight.	N. Y. <i>Manana & Mexican Mail S. S. Co.</i>	J. W. Reynolds.	Hugo	A. de Nigica.
Br. a. s. <i>Chimera</i>	Thomas Burley.	Am. s. s. <i>City of Alexandria</i>	W. M. Rettig.	Joseph Ferras	John J. McEgan.
Bombay India Navigation Company.		City of Washington		Lorenzo D. Baker	Wm. F. Wiley.
Br. a. s. <i>Chaitan Latta</i>	C. Journeil.	North German Lloyd Steamship Co.		Macedonia	W. Watson.
British India Line.		Br. a. s. <i>America</i>	G. Meyer.	Menahela	J. B. McKie.
Br. a. s. <i>Brooklyn City</i>	W. Pitt.	Bona	C. Pohl.	Navarro	S. de Aldaco.
London City	T. H. Gore.	Kid	H. Heimer.	Neustria	P. Verriest.
Wells City	T. L. Weiss.	Kid	W. Willigerod.	Oxfordshire	C. F. Jones.
Canada Shipping Co.		Falia	A. Meier.	Pesonic	John Jenkins.
Br. a. s. <i>Lake Winnipeg</i>	H. Campbell.	Humboldt	H. Christoffers.	Rajata	J. H. Jurek.
Lake Superior	Wm. Stewart.	Mait	F. Pfeiffer.	Royal Water	Henry Campbell.
Canadian Line.		Neckar	H. Bruns.	St. Roman	Thos. Potter.
Br. a. s. <i>London</i>	E. N. Gager.	Occidental and Oriental Steamship Co.		Sulima	Ch. Off. J. A. Estopini.
Hudson	H. R. Freeman.	Br. a. s. <i>Oceanic</i>	John Metcalf.	Vaincia	Capt. L. Murray.
Concord Line.		Ocean Steamship Company.		<i>New York Herald Weather Service.</i>	
Br. a. s. <i>Aurora</i>	W. H. P. Hains.	Am. s. s. <i>City of Auguste</i>	K. S. Nickerson.	Br. a. s. <i>Acapulco</i>	W. G. Blackford.
Catalonia	Alor McKay.	Junata	S. L. Ashins.	Adriatic	H. Parwell.
Etoria	T. Cook.	Chattanooga	W. B. Catharine.	Advance	J. E. Heers.
Gallia	M. Murphy.	Nacoochee	Ch. Off. C. G. S. Burg.	Albano	J. W. Sanson.
Pyrenia	P. Cottier.	Oceanic Steamship Company.		Alme	H. B. Hughes.
Servia	B. Woolfenden.	Am. s. s. <i>Mariposa</i>	Capt. H. M. Hayward.	Alme	E. J. Sedgers.
Edward Orr's S. S. Line.		Old Dominion Steamship Company.	Frank Stevens.	Alme	J. B. Percy.
Br. a. s. <i>Australia</i>	G. Frauch.	Am. s. s. <i>Manhattan</i>	Thomas Wallace.	Alme	D. Williams.
Catholics	O. Winkler.	Oregon Railway and Navigation Co.	Fred Hollis.	Alme	S. Burton.
Europe	L. A. Kossel.	Am. s. s. <i>City of Chester</i>	H. S. Achley.	Alme	W. A. Raynon.
Polypia	A. Kuhn.	Colombia	E. Polemann.	Alme	H. Perry.
Farman Line.		Geo. W. Elder		Alme	J. W. Reynolds.
Br. a. s. <i>Boston City</i>	W. T. Sherborne.	Pacific Coast Steamship Company.		Alme	Fred Watkins.
Durham City	M. F. Lund.	Am. s. s. <i>Orizaba</i>	John N. Ingalls.	Alme	Benj. Glendell.
Stockholm City	M. Doyle.	Santa Rosa	C. B. Johnson.	Alme	T. M. McKnight.
General Trans-Atlantic Steamship Co.		Pacific Mail Steamship Company.		Alme	Arthur Lewis.
Br. a. s. <i>America</i>	E. Santelli.	Am. s. s. <i>City of New York</i>	Robt. B. Searle.	Alme	Chas. Lima.
Canada	O. de Kersabiec.	City of Park	L. Dexter.	Alme	Robt. B. Quick.
St. Germain	P. Traub.	City of Peking	G. G. Berry.	Alme	W. Willigerod.
Laborador	P. d'Hauterive.	City of Rio Janeiro	Wm. R. Cobb.	Alme	F. V. Schierbeck.
Norwegian	E. Frangeni.	City of Sydney	H. C. Pearson.	Alme	A. J. Griffin.
St. Laurent	M. de Jouselin.	Colima	J. M. Casterly.	Alme	James Brown.
Great Western S. S. Line.		Granada	W. B. Chapman.	Alme	P. Cottier.
Br. a. s. <i>Derwent</i>	Ch. Off. Wm. H. Bates.	San Juan	A. D. Austin.	Alme	S. Garvin.
India Line.		Penang Steamship Company.		Alme	F. H. Bonjer.
Br. a. s. <i>Abdulla</i>	Capt. J. Price.	Br. a. s. <i>Netley Abbey</i>	H. N. Vyvyan.	Alme	Jas. Watson.
Alaska	Gm. S. Murray.	Quebec Steamship Company.		Alme	H. Weyer.
Arcton	J. Price.	Br. a. s. <i>Muriel</i>	G. S. Locke.	Alme	J. C. Irving.
Norfolk	John Douglas.	Orinoco	Jas. S. Garvin.	Alme	J. C. Jamison.
Winnipeg	Edward Bentley.	Red Cross Line.	W. J. Fraser.	Alme	Capt. G. A. Connor.
Hawley American Line.	O. L. Rigby.	Br. a. s. <i>Theresa</i>	I. Hemphorne.	Alme	A. J. Mann.
Br. a. s. <i>Bahama</i>	B. Karlson.	Red "D" Line.	W. M. Hopkins.	Alme	A. G. Brues.
Galicia	W. Kulewein.	Am. s. s. <i>Caracas</i>	Sam. Hess.	Alme	H. Buschmann.
London	B. Voss.	Philadelphia	Wm. Woodrick.	Alme	M. de Jouselin.
Murray	O. Vogel.	Valencia		Alme	G. J. Vis.
Kluis	H. Vogel.	Red Star Line.		Alme	Com. W. G. Handl.
Rugia	A. Albore.	Belgian	W. A. Beynon.	Alme	
Saxony	C. Ludwig.	Norland	Allen J. Griffin.	Alme	Capt. R. W. Storer.
Japan Line.		Penland	H. E. Nickels.	Alme	W. W. Gheen.
Br. a. s. <i>City of Berlin</i>	Francis S. Land.	Rhyland	Rud. Weyer.	Alme	Nathan Hoken.
City of Chicago	Fred Watkins.	Switzerland	J. C. Jamison.	Alme	L. L. Lewis.
City of Richmond	A. W. Lewis.	Wainland	H. C. Jamison.	Alme	J. W. Cates.
Johnson Line.		Westernland	J. Buchmann.	Alme	W. H. White.
Br. a. s. <i>New York</i>	John Inch.	Zoeland	J. Ueberweg.	Alme	John H. Johnson.
Longport & Co's Steamship Company.		Rotterdam Line.	Com. W. G. Randle.	Alme	E. E. Moe.
Br. a. s. <i>Bomb</i>	Chas. J. Watson.	Br. a. s. <i>Edam</i>	Capt. L. De Smet.	Alme	Daniel Thoms.
Bahia	Fred Graham.	Leerdam	J. H. Taat.	Alme	H. Haasloep.
Bahia	J. Russell.	P. Caland	P. Sliedrecht.	Alme	E. Coggins.
Bahia	Alex. W. Pym.	Schiedam	T. H. Bonjer.	Alme	A. H. Child.
Havelland	W. P. Ballentine.	W. A. Scholten	G. Bakker.	Alme	G. A. Scholten.
Br. a. s. <i>Hipparchus</i>	John Carroll.	Zaandam	G. J. Vis.	Alme	O. G. Ellingen.
Kopier	Wm. Kelly.	State Line.	H. van der Zee.	Alme	B. F. Rice.
Lassell	R. Johnson.	Br. a. s. <i>State of Georgia</i>		Alme	W. T. Bacon.
Mozart	Robt. Graham.	State of Nebraska	G. Muel.	Alme	W. H. Mague.
Oliver	Wm. Spratt.	State of Nevada	John A. Brown.	Alme	F. N. Marvin.
Plato	James Clarke.	State of Pennsylvania	Alfred Mann.	Alme	J. N. Todd.
Belg. a. s. <i>Rome</i>	John P. Davis.	Virginian Line.		Alme	C. Fiore.
England Line.	James Dixon.	Dan. a. s. <i>Geiser</i>		Alme	Joseph W. Watia.
Br. a. s. <i>Yonatan</i>	Robert Leash.	Hekla	C. W. Muel.	Alme	John Stohli.
Virginian	W. H. Traut.	Thingwall	A. G. Thoms.	Alme	A. F. Vesper.
Malaga Line.	M. Pitt.	U. S. and Brazil Mail S. S. Co.	S. T. H. Laab.	Alme	A. Alexander.
Br. a. s. <i>Colorado</i>	Sam. Risk.	Br. a. s. <i>Alvares</i>	Jas. R. Beers.	Alme	H. F. Schive.
Lampara	M. B. Crowell.	Racco Line.		Alme	G. Thoms.
Sun Maroon	A. G. Burrows.	Br. a. s. <i>Alvares</i>		Alme	Edgar Orr.
Norwegian & New York Steamship Co.	J. H. Martin.	Br. a. s. <i>Alvares</i>		Alme	D. C. McIntosh.
Br. a. s. <i>Tunika</i>	F. Bouchette.	Br. a. s. <i>Alvares</i>		Alme	Daniel B. Darrah.
Br. a. s. <i>Montreal</i>	W. P. Couch.	Br. a. s. <i>Alvares</i>		Alme	John Colie.
Br. a. s. <i>Montreal</i>	Jas. McAuley.	Br. a. s. <i>Alvares</i>		Alme	A. S. Hayes.
Br. a. s. <i>Montreal</i>	John Harrison.	Br. a. s. <i>Alvares</i>		Alme	Thos. D. French.
Br. a. s. <i>Montreal</i>		Br. a. s. <i>Alvares</i>		Alme	A. W. Flemming.
Br. a. s. <i>Montreal</i>		Br. a. s. <i>Alvares</i>		Alme	H. Fokker.
Br. a. s. <i>Montreal</i>		Br. a. s. <i>Alvares</i>		Alme	Charles Brown.
Br. a. s. <i>Montreal</i>		Br. a. s. <i>Alvares</i>		Alme	N. E. Reynolds.

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MONTHLY WEATHER REVIEW.

VOL. XIV.

WASHINGTON CITY, JANUARY, 1886.

No. 1.

INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during January, 1886, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic Ocean during the month are also given, and their approximate paths shown on chart i.

The most noteworthy meteorological feature of the month was the area of high pressure, described herein as number i, and the attendant cold wave, which passed over the districts east of the Rocky Mountains from the 6th to the 12th. The loss of life and stock in the western districts was very great, and during the eastward movement of this high area the lowest temperatures recorded in many years occurred in the Southern States, causing much suffering among the people of that section. Very heavy losses to agricultural, fruit-growing, and other interests throughout the South also resulted from this cold wave.

The average number of areas of low pressure for the month of January during the last twelve years is 13.2. The paths of the centres of eleven low areas are traced on chart i for January, 1886.

The mean temperature for the month averaged below the normal over nearly the whole country, the exceptions being California, the western portions of the middle and southern plateau districts, northern New England, and the Canadian Maritime Provinces. The most marked deficiencies occurred in the Southern States and Missouri Valley.

The precipitation was in excess of the average on the Pacific coast, in the Rocky Mountain regions and thence eastward over the northern districts to the Atlantic coast. In the Southern States, except over portions of Alabama, Mississippi, and Louisiana, there was a general deficiency. The greatest departure from the normal precipitation occurred in California, where it was from two to three inches in excess of the average.

In the preparation of this REVIEW the following data, received up to February 20, 1886, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and thirty-three Signal Service stations and fifteen Canadian stations, as telegraphed to this office; one hundred and sixty-one monthly journals and one hundred and sixty-five monthly means from the former, and fifteen monthly means from the latter; two hundred and ninety-seven monthly registers from voluntary observers; sixty monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the New England Meteorological Society, and from the local weather services of Alabama, Illinois, Indiana, Iowa, Minnesota, Nebraska, Ohio, and Tennessee, and of the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

logical Society, and from the local weather services of Alabama, Illinois, Indiana, Iowa, Minnesota, Nebraska, Ohio, and Tennessee, and of the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE.

[Expressed in inches and hundredths.]

The mean atmospheric pressure for January, 1886, determined from the tri-daily telegraphic observations of the Signal Service, is shown by the isobarometric lines on chart ii. It will be seen from this chart that the mean pressure is greatest over the extreme northwest, upper Missouri valley, and northern slope, while the area of least pressure occupies the north Pacific coast. The isobar for 30.35 indicates the region of greatest pressure, and that for 29.95 shows the region over which the barometric means were lowest. The highest monthly barometric means, 30.36 and 30.37, were reported from Poplar River, Montana, and Fort Garry, Manitoba, respectively; and the lowest, 29.92 and 29.94, occurred at Fort Canby and Tatoosh Island, Washington Territory, respectively. In the districts east of the Mississippi River the barometric means range from 30.0 to 30.1, the lower means occurring at stations on the Atlantic coast and in the lower lake region. Over the southern districts to the west of the Mississippi the mean pressure generally ranges from 30.1 to 30.2.

As compared with the mean pressure for the preceding month, an increase has occurred in the lower Missouri valley and in the northern districts from western Montana to the Atlantic coast, the difference being greatest in the extreme northwest, where it amounts to from .15 to .21. In all other districts the mean pressure for January, 1886, is lower than for the preceding month, the difference being most marked in the central Rocky Mountain districts and east Gulf states, where it ranges from .10 to .14.

The departures from the normal pressure at the various Signal Service stations are given in the tables of miscellaneous meteorological data, and on chart iv they are exhibited by lines connecting stations of equal departure. In the upper Missouri valley, extreme northwest, and in portions of the upper lake region and northern slope, the mean pressure for January, 1886, is above the normal, the departures being greatest at stations in northern Dakota and northern Minnesota. Over a small area, including portions of the Indian Territory and Texas, the mean pressure is normal, or slightly above. In all other parts of the country the pressure is below the normal, the departures being greatest on the north Pacific coast and in the Atlantic coast districts south of New England, where they generally exceed .10.

BAROMETRIC RANGES.

The following are some of the extreme monthly ranges:

Greatest.	Least.
Inches.	
Boston, Massachusetts	Key West, Florida
Sandy Hook, New Jersey	Fort Davis, Texas
New London, Connecticut	Fort Grant, Arizona
New York City	Fort Apache, Arizona
Portland, Maine	Fort Thomas, Arizona
Atlantic City, New Jersey	Prescott, Arizona
New Haven, Connecticut	Los Angeles, California
Block Island, Rhode Island	Keeler, California
Eastport, Maine	Yuma, Arizona

The monthly barometric ranges are also given in the tables

of miscellaneous data; they were greatest at stations along the New England and middle Atlantic coasts, and least over the southern plateau and southern Florida.

AREAS OF HIGH PRESSURE.

Four areas of high pressure appeared within, or near, the limits of the stations of observation during the month. Only two of these areas passed eastward to the Atlantic coast, while a third was far to the north of Manitoba on the 25th, and disappeared north of Lake Superior, without causing any marked change in the weather conditions within the United States. The fourth area extended over the Rocky Mountain regions during the last three days of the month and had advanced to the Missouri Valley by the midnight report of the 31st.

I.—This is probably the most noteworthy high area which has appeared within the limits of the United States for several years, as it was attended by a cold wave which extended over the entire country east of the Rocky Mountains, causing unusually low temperatures, especially in the southern sections of the country. The barometer was high from the Rocky Mountain regions to the Pacific coast on the 2d, and from that date to the 5th a slow northeasterly movement of this high area was observed; after the 5th there was an apparent increase of this high area from the region north of the Saskatchewan Valley and Manitoba. On the morning of the 6th it had so increased as to leave little doubt of the immediate approach of a decided cold wave, and warnings and cold-wave signals were ordered for the extreme northwestern stations. The following warnings were sent on the afternoon of the 6th:

WASHINGTON CITY, January 6, 1886—4.45 p. m.

To observers, Cheyenne, Wyoming; North Platte, Nebraska; Yankton, Dakota; Denver, Colorado; Dodge City, Kansas; Omaha, Nebraska; Concordia, Kansas; Leavenworth, Kansas (repeating to Wellington); Kansas City, postmaster, and dispatcher Fort Scott and Gulf Railway; Lamar, Missouri:

Hoist cold-wave signal. Cold wave, accompanied by a "norther;" temperature will fall from 20° to 25° in the next twenty-four hours at western and northern stations, and in twenty-four to thirty-six hours at southern stations.

HAZEN.

The centre of greatest barometric pressure remained north of Dakota from the 6th until the 12th, but the cold wave had reached the Gulf coast and Florida before that date, causing, in many places, a lower temperature than had been observed in many years. The barometer ranged from 30.70 to 30.99 in the Northwest during the advance of this cold wave, and then the centre of high pressure moved southward to Arkansas on the 12th, where the pressure had decreased to 30.60. After the 12th this high area moved eastward to the Atlantic coast and thence northeastward; it followed the coast line, passing over Nova Scotia and disappearing to the eastward on the 16th.

The special charts issued with this REVIEW show the isothermal lines at each of the 7 a. m. telegraphic reports from the 5th to the 12th, inclusive.

The telegraphic warnings and orders for the display of cold-wave signals issued by this office are given below, in the order in which they were issued, for the purpose of illustrating the value of such warnings:

WASHINGTON CITY, January 7, 1886—12.02 a. m.

To observers, Saint Paul, Minnesota (repeating to Northfield and to Professor Payne, for interior of state); Madison, Wisconsin; C. P. Chapman; Dubuque, Iowa; Des Moines, Iowa; Davenport, Iowa; Keokuk, Iowa; Springfield, Illinois; Saint Louis, Missouri (repeating to Professor Nipher, for interior of state); Cairo, Illinois; Memphis, Tennessee; Little Rock, Arkansas; Shreveport, Louisiana; Galveston, Texas; Abilene, Texas:

Hoist cold-wave signal. There is a cold wave advancing from Montana; the temperature in the upper Mississippi valley will fall from 15° to 20° during to-day and to-night, and in the southern portion of the Mississippi Valley, Texas, and Arkansas in the next twenty-four to thirty-six hours, with a "norther" in Texas.

HAZEN.

WASHINGTON CITY, January 7, 1886—12.05 a. m.

To assistant superintendent of telegraph, International and Great Northern Railroad, Palestine, Texas; general superintendent, Texas and Saint Louis Railway, Pine Bluff, Arkansas; superintendent of telegraph, Texas and Pacific Railway, Marshall, Texas; general superintendent, Houston and Texas Central Railway, Houston, Texas; general superintendent, Galveston,

Harrisburg, and San Antonio Railway, Houston, Texas; general superintendent, Mexican National Railway, Corpus Christi, Texas:
Cold wave approaching; temperature will fall 15° to 25° during the next twenty-four to thirty-six hours.

HAZEN.

WASHINGTON CITY, January 7, 1886—12.30 a. m.

To observer, Saint Louis, Missouri:

There is a severe cold wave moving slowly southeastward from Montana; it will cover the Missouri Valley to-day and the Mississippi Valley during the night, with a "norther" in the Western States.

HAZEN.

WASHINGTON CITY, January 7, 1886—12.40 a. m.

To observers, Milwaukee, Wisconsin; Chicago, Illinois:

Hoist cold-wave signal. The temperature will rise slightly to-day, but will be followed on Friday by a cold wave which will cause the temperature to fall 15° to 25°.

HAZEN.

WASHINGTON CITY, January 7, 1886—10.25 a. m.

To observers, New Orleans, Louisiana; Vicksburg, Mississippi:

Hoist cold-wave signal; severe cold wave approaching, which will cause damaging frosts in Louisiana and Texas Friday and Saturday mornings.

HAZEN.

WASHINGTON CITY, January 7, 1886—5.55 p. m.

To Baltimore and Ohio Telegraph superintendents, Selden, Baltimore, Maryland; Zeublin, Chicago, Illinois; and chief in charge Baltimore and Ohio Telegraph Office, New York City:

The cold wave previously mentioned will extend over Indiana and Kentucky during Friday.

HAZEN.

WASHINGTON CITY, January 7, 1886—5.15 p. m.

To observers, Greencastle, Indiana; Indianapolis, Indiana; Cincinnati, Ohio; Nashville, Tennessee; Chattanooga, Tennessee; Knoxville, Tennessee; Montgomery, Alabama; Auburn, Alabama; Professor Mell; Atlanta, Georgia; Mobile, Alabama:

Hoist cold-wave signal. A cold wave coming; the temperature will fall from 20° to 25° in the next thirty-two hours in western Ohio, Indiana, Kentucky, from 20° to 25° in Tennessee, and from 20° to 30° in the eastern Gulf states.

HAZEN.

WASHINGTON CITY, January 7, 1886—5.45 p. m.

To observer, New Orleans, Louisiana:

The cold wave will be unusually severe in Louisiana and Texas; parties interested should take warning to protect against frost.

HAZEN.

WASHINGTON CITY, January 7, 1886—6 p. m.

To observer, Grand Haven, Michigan:

Hoist cold-wave signal. The cold wave now central in the Missouri Valley. The temperature will remain nearly stationary, followed during Friday or Friday night by a fall of from 15° to 20°.

HAZEN.

WASHINGTON CITY, January 8, 1886— — m.

To observers, Jacksonville, Florida; Charleston, South Carolina; Chattanooga, Tennessee; and David Risley, Georgetown, South Carolina; Prof. P. H. Mell, jr., Auburn, Alabama; J. E. Ingraham, Sanford, Florida:

Decidedly colder, freezing weather to-night in northwestern Florida, Alabama, and Tennessee, with a severe cold wave, which will overspread the south Atlantic states and Florida during Saturday and on Sunday morning; damaging frosts as far south as Tampa Bay.

HAZEN.

WASHINGTON CITY, January 8, 1886—11 a. m.

To observers, Grand Haven, Michigan; Detroit, Michigan; Toledo, Ohio:

Hoist cold-wave signal. Cold wave coming; temperature will fall from 15° to 20° during Saturday night, but will begin to be felt during Saturday, preceded by slightly warmer weather.

HAZEN.

WASHINGTON CITY, January 8, 1886—11.33 a. m.

To observers, Charlotte, North Carolina; Wilmington, North Carolina:

Hoist cold-wave signal. The temperature will rise slightly to-day, followed by decidedly colder weather and a severe cold wave.

HAZEN.

WASHINGTON CITY, January 8, 1886—5.45 p. m.

To observers, Columbus, Ohio; Pittsburg, Pennsylvania; Sandusky, Ohio; Cleveland, Ohio; New York City; Philadelphia, Pennsylvania; Baltimore, Maryland; Washington City; Lynchburg, Virginia; Richmond, Virginia; W. D. Chesterman, Chamber of Commerce; Norfolk, Virginia:

Hoist cold-wave signal. Cold wave now advancing from the West, and will cause fall in temperature of from 15° to 20° during Saturday and Saturday night.

HAZEN.

WASHINGTON CITY, January 8, 1886— — m.

Professor Thomas, Columbus, Ohio; J. G. McCandlish, Pittsburg, Pennsylvania:

Cold wave now advancing from the West, and will cause fall in temperature of from 15° to 20° during Saturday night.

HAZEN.

WASHINGTON CITY, January 8, 1886—5.55 p. m.

To Superintendent Selden, Baltimore and Ohio Telegraph Company, Baltimore, Maryland; Zeublin, Chicago, Illinois; chief in charge Baltimore and Ohio Telegraph Company, New York City:

The cold wave is already felt in Indiana, Illinois, Kentucky, and will move slowly eastward over Ohio, Pennsylvania, West Virginia, Virginia, and Maryland during Saturday night or on Sunday.

HAZEN.

WASHINGTON CITY, January 9, 1886—12.40 a. m.

To observers, Boston, Massachusetts; New London and New Haven, Connecticut:

Hoist cold-wave signal. A cold wave approaching; the temperature will rise slightly at Boston to-day, to be followed during the night and on Sunday by a fall in the temperature of from 15° to 20°

HAZEN.

The accompanying notes from observers serve to indicate the intense effect of this cold wave in the several sections of the country:

North Platte, Nebraska: a severe "norther" occurred on the 6th and 7th; business was entirely suspended and railroad trains delayed for several hours.

Wellington, Sumner county, Kansas: a severe cold wave and high wind, with snow, occurred on the 7th; the extent and duration of the storm, in connection with the extreme low temperature, characterized it as one of the severest ever known in western Kansas; two men were frozen to death in this county. Many heeded the timely warning of the cold-wave signal that was displayed, and large numbers of stock were cared for that would otherwise have been lost.

Salina, Saline county, Kansas: an unusually severe storm occurred on the 7th, the wind averaging thirty-five miles per hour, and continued for about twenty hours; great loss was occasioned to the sheep and cattle interests in the western portion of the state.

Dodge City, Kansas: one of the most severe storms that has been experienced in this locality for several years occurred on the 7th; the wind blew a gale from the north, averaging forty miles per hour, with a mean temperature for the day of 10° below zero; the snow was so blinding that at no time during the day could a person see a rod ahead; a number of people and a large amount of stock were frozen to death.

Fort Supply, Indian Territory: a terrific "norther" occurred on the 7th and 8th, the wind reaching a velocity of fifty miles per hour, accompanied by a low temperature and, at times, a blinding fall of snow; much suffering was caused, and large numbers of cattle were frozen to death; ice formed to the depth of eleven inches, and the snow piled up in huge drifts.

Reports from Fort Reno, Indian Territory, state that in Greer county, and on the Wichita and Comanche reservation, thousands of cattle were frozen to death during the prevalence of the "norther" on the 7th and 8th.

Oskaloosa, Mahaska county, Iowa: reports from various parts of the state show that from the 7th to 11th about twenty lives and a large amount of stock were lost on account of the extreme cold.

Sioux City, Woodbury county, Iowa: the high wind and extreme cold of the 8th and 9th was unprecedented; all trains were practically abandoned.

Hamburg, Fremont county, Iowa: a heavy blizzard occurred on the 8th; railroad trains were abandoned, and much damage done to stock.

Nashville, Tennessee: from the 9th to the 10th the cold was the most severe known in this city for the past forty years; while other cold waves have shown a lower minimum temperature, notably those of January, 1877, 1884, and 1885, still, the mercury did not remain below zero as long as in the cold wave of January, 1886.

Memphis, Tennessee: the temperature fell to 8° below zero on the morning of the 9th, being the lowest since the establishment of this station in 1871.

New Orleans, Louisiana: the cold wave struck this city at 3 a. m. of the 8th, and the temperature fell throughout the day, the thermometer recording 19° at 11 p. m., and falling to 15° on the morning of the 9th. Great damage was done to the sugar-growing interest in this state and Texas.

Shreveport, Louisiana: the 8th was the coldest day in the history of this station, the minimum thermometer recording 1°.

Indianola, Texas: the coldest weather experienced for several years occurred from the 8th to the 13th; ice from one-quarter inch to three inches thick formed on bayous and ponds; on the 12th snow fell to the depth of three inches.

The following is an extract from a special report of the Signal Service observer at Galveston, Texas, in reference to the cold wave from the 7th to 13th: "Hoist cold-wave signal, January 7th, 1.20 a. m.; were the well-timed warning notes that preceded the heaviest snowfall, severest frost, and the most intense cold wave ever experienced in this city or vicinity, either by comparison with the records of this office or with the most reliable data to be obtained from the very oldest residents. At 11 a. m. of the 6th the barometer commenced to fall rapidly and the temperature to increase correspondingly, and at 1.20 p. m. of the 7th the temperature was as high as 65°. At 5.50 p. m. of the 7th the wind reached a storm-velocity of twenty-five miles per hour from the north, and kept on increasing, until, at 7.20 p. m., the wind registered forty-two miles per hour. After the advent of the "norther," at 5.50 p. m., the temperature commenced to fall with unprecedented rapidity; about 9 p. m. of the 7th ice commenced to form, and at the morning observation of the 8th the minimum thermometer recorded 11°, the lowest of which there is any record, being a fall of 54° in less than eighteen hours, causing intense suffering. The great and continued cold of the day and night of the 9th caused Galveston Bay to freeze over. Frosty and cold weather continued throughout the 10th and 11th, and at 3 a. m. of the 12th a heavy snow set in, covering the ground to the depth of about six inches."

San Antonio, Texas: on the morning of the 12th the ground was covered with snow, a very rare occurrence at this place, and one that has not occurred before since 1866. The long spell of cold weather was the most severe in many years, and caused considerable loss of stock.

Palestine, Texas: the "norther" which began on the 7th continued throughout the 8th, the weather being the coldest ever known at this place; the minimum thermometer recorded 0°, which is 6° lower than has ever been recorded; telegraph lines were prostrated, water mains in the city frozen, and ice from three to six inches thick formed on lakes and ponds.

Fort Elliott, Texas: a severe "norther" occurred on the 7th; 14,000 head of cattle were frozen to death in this vicinity, and several persons badly frost-bitten.

Mobile, Alabama: on the morning of the 9th the minimum thermometer recorded 11°, which was the coldest on record since the establishment of the signal office at this place in 1871, and from other reliable sources the coldest since 1852, at which time the thermometer fell to 8°. The extreme cold destroyed the largest cotton crop ever known, plants out and under cover were killed; the loss will aggregate \$750,000.

Montgomery, Alabama: on the morning of the 9th the minimum thermometer recorded 5° 4, which is the lowest on record since the establishment of the station in 1872.

Greensborough, Hale county, Alabama: at 7 a. m. of the 9th the thermometer was 2°, which is the coldest ever recorded, and the average temperature for the 9th and 10th was the lowest ever known at this place; ice from four to five inches thick formed on ponds from the 9th to 13th.

Birmingham, Jefferson county, Alabama: during the cold spell from the 8th to 14th, ice formed four inches thick; great damage was done to fruit trees and garden vegetables.

Pensacola, Florida: the most severe cold spell ever known occurred from the 9th to 13th, the minimum thermometer recording 14° 9 on the morning of the 9th; the salt water along the shore of the bay froze to a considerable thickness, and ice three inches thick formed on ponds; great damage was done to fruit trees.

The following is an extract from the Pensacola (Florida) "Commercial," of January 16th: "One of the most remarkable results of the late cold snap was the curious effect it had on the fish in the shallow bayous. On the 12th several fishermen visited the Little Sabine, on Santa Rosa Sound, for the purpose of capturing any fish that might be benumbed by the cold. The Sabine was found frozen from shore to shore, and under the ice, in water ranging from two to four feet in depth, they found hundreds of fish so paralyzed with cold as to be almost motionless. By breaking the ice ahead of the boat the fish were easily speared and captured, fully 2,500 pounds being secured. They were mostly trout, mullet, and red fish, and some were of large size. This is certainly a proof of the unusual severity of the cold in this section."

Jacksonville, Florida: it is estimated that the damage done to fruit by the cold spell from the 9th to 12th will reach \$1,000,000; the entire crop of fruit unpicked was frozen; ice formed on the shallow parts of the river, and water-pipes and hydrants in the city froze.

Gainesville, Alachua county, Florida: the temperature fell to 16° on the morning of the 11th, causing great damage to fruit trees; oranges unpicked were frozen, and ice formed two and a half inches thick.

Orlando, Orange county, Florida: the weather during the 11th and 12th was the coldest ever known; great damage has been done to fruit and tender plants.

Fernandina, Nassau county, Florida: business was practically suspended on the 11th and 12th on account of the extreme cold weather.

The following is an extract from the report of the Signal Service observer at Sanford, Florida: "The warning of the approach of the cold wave was received at 11.45 a. m. of the 8th, and immediately sent to all points. On receipt of the warning, owners of orange groves employed men to gather wood and other combustibles and place them on the west and north sides of their groves, ready to be ignited, hoping by this means to protect trees and crops from damage; their faith in the prediction of the Signal Service was such that many went to considerable trouble and expense. On the evening of the 9th the country was lighted up with the fires that had been ignited when the temperature reached 32°. On the morning of the 10th temperature fell to 21°, being the lowest ever recorded at this place; ice formed more than an inch thick; crops were destroyed; young orange trees killed, and old trees seriously injured; pineapples and bananas were killed, and many water pipes froze and burst. The cold weather continued throughout the 11th and 12th; on the latter date an inappreciable amount of snow fell."

Live Oak, Suwannee county, Florida: the thermometer on the morning of the 12th was 16°; two of the largest ponds in this place were frozen over, the ice being from one-half to three-fourths of an inch thick.

The following is an extract from the report of the Signal Service observer at Cedar Keys, Florida: "The cold wave of the 8th to 12th was very severe; the damage in this vicinity amounts to about \$5,000, chiefly to the fish and oyster business; in the state the damage is estimated at \$2,100,000, and it is doubtful if there are five hundred boxes of oranges left in the whole state; a large number of young trees have been killed or seriously injured, the old trees suffered but little; reports in regard to the damage done are conflicting, but the above statement may be relied upon as correct, as I make it upon the best authority and by personal inspection. Very few oranges are grown in this immediate vicinity, but by sending the warnings received on the 7th to neighboring towns, it accomplished much good and saved a good deal of fruit which was gathered before the freeze. The public showed their appreciation of the timely warning given by the Signal Service by high praise through the press, and to the observer in person."

Manatee, Manatee county, Florida: on the 10th the beach was lined with frozen fish; ice formed on ponds and shallow water on the 12th, causing the destruction of large numbers of fish.

Lake City, Columbia county, Florida: ice formed on the 11th and 12th from two to three inches thick; oranges on trees were frozen.

Tampa, Hillsborough county, Florida: quite a number of flakes of snow fell on the 11th.

Cedar Keys, Florida: the cold weather experienced during the week ending the 16th was without precedent; ice formed one and-a-half inches thick,

and at Sara Sota (one hundred and twenty-five miles south of this place) a snow storm raged for four hours.

Key West, Florida: the lowest temperature since the establishment of this station occurred on the 12th; a temperature of 19° was recorded at Tampa, where ice formed to the thickness of an inch on shallow water; throughout southern Florida the thermometer fell below freezing, and the injury done to the fruit interest is incalculable.

Mr. Charles C. Livermore, Fort Gatlin, Orange county, Florida, reports that at 6 a. m. of the 12th the temperature was 19°.5; at 6 p. m. sleet began, and at 8 p. m. it turned into snow. This was the first instance on record of snow falling at this place.

Atlanta, Georgia: the thermometer fell to 2°.4 below zero on the 11th, which is the lowest on record; the ground was frozen to the depth of eighteen inches; twelve inches has always been considered below the freezing line by builders.

Augusta, Georgia: the temperature fell to 6°.0 on the morning of the 12th, which is the lowest in the record of the Signal Service, and, from information from trustworthy sources, the coldest weather experienced since 1835.

Savannah, Georgia: on the morning of the 12th the minimum thermometer recorded 12°, being the lowest ever recorded at this place; Ogeechee Canal froze, and people crossed on the ice; this has never occurred before; gas-metres and water-pipes froze, and great damage was done to crops.

Milledgeville, Baldwin county, Georgia: a more protracted cold spell is not remembered here; oats and all growing crops, except onions and spinach, were generally killed; on the 12th the river froze over, which is an unusual occurrence.

Athens, Clarke county, Georgia: the cold spell from the 9th to the 15th was the severest in the past ten years; the temperature is known to have been lower, but the duration and the accompanying strong wind made it unusually severe. The Oconee River froze on the 13th, which is an extremely rare occurrence.

Mr. C. B. La Hatto, Gainesville, Hall county, Georgia, furnishes the following: "The cold spell from the 8th to the 16th was the severest ever experienced in this region. During the night of the 8th four inches of snow fell, and on the morning of the 9th the temperature was 0°, the average for that day being 3°.8. On the 10th it was 2°.0 below zero, and on the morning of the 11th 7°.0 below zero, which was the minimum recorded during the cold spell; at noon the temperature was zero, the average for the day being 1°.3. * *

Much suffering was caused among the poorer classes and to cattle; some trees were killed, and all tender shrubbery seriously injured if not killed. The ground froze to the depth of eighteen to twenty inches in exposed places, and small running streams froze over."

Charleston, South Carolina: the minimum thermometer recorded 10°.5 on the morning of the 11th, which is the lowest since the establishment of this station; ice three inches thick formed on ponds; all the early vegetables were killed, and several persons froze to death in this vicinity.

New River Inlet, North Carolina: the average minimum temperature for the 10th, 11th, 12th, and 13th was 9°.4, which, from all information obtainable, was the coldest weather ever known in this vicinity. The ice in New River is from six to eight inches thick, causing the suspension of navigation, which has not occurred before since 1835.

Mr. T. C. Harris, of the Department of Agriculture, Raleigh, North Carolina, reports as follows: "The cold spell from the 9th to the 13th was remarkable for this place, the thermometer falling to 5° on the mornings of the 11th and 12th; ice from three to seven inches thick formed on ponds. In western North Carolina the cold was much more intense, being as low as -12° in some places."

Mr. W. G. Simmons, voluntary observer at Wake Forest College, Wake county, North Carolina, reports that on the morning of the 8th there was a light fall of snow; on the morning of the 9th the minimum thermometer recorded 17°.5, from which time it gradually fell until the morning of the 12th, when it recorded 2°.0; the weather was clear throughout the cold spell.

Mr. Howard Shriver, voluntary observer at Wytheville, Wythe county, Virginia, reports as follows in reference to the cold spell in January: "All records revert to 1835 as the last date at which such a cold wave occurred. The temperature for a week was but a little above or a little below zero, the minimum at this place being 8° below zero on the morning of the 11th; reports from neighboring towns give 13°, 18° and 20° below zero; all these reports come from a belt lying to the south or southeast of my station, and the same phenomenon has occurred several times before, indicating the presence of a colder belt there than at this place; during this storm the wind was the most violent ever experienced; six inches of snow fell, and the drifts were eight to twelve feet deep."

Strafford, Strafford county, New Hampshire: the 12th was the coldest day for the past twenty-seven years.

II.—This area appeared north of Montana at 10 p. m. of the 13th, when the preceding one extended over the Atlantic coast districts, the high areas being separated by a well-defined low area which passed almost directly north from the Gulf States over the upper lake region. This high area remained in the region north of Dakota and Minnesota until the 22d, when it moved southward to northern Iowa and thence eastward over the Lake region and the Saint Lawrence Valley during the 23d, 24th, and 25th, when it disappeared over the north Atlantic.

III.—This area was at no time within the limits of the United States, but it was first observed on the 25th far to the north of Manitoba, and after moving slowly eastward during the 26th and 27th it apparently disappeared as a separate area without causing decided changes of temperature within the United States or Canada.

IV.—This area appeared north of Montana on the morning of the 28th and extended southward over the Rocky Mountain districts; the barometer, however, was not unusually high (ranging from 30.40 to 30.50) and no decided fall of temperature was observed. This area extended westward over the plateau regions during the following day, and on the 30th and 31st it extended eastward over the Missouri Valley, where it was central at the close of the month.

AREAS OF LOW PRESSURE.

Eleven areas of low pressure have been traced upon the tri-daily weather charts for January, while several barometric depressions appeared near the coast or along the northern boundary of the United States, which, although indicating the presence of low areas, were not sufficiently well defined to render it possible to locate on the chart the centre of depression. Six of these low areas apparently formed near the west Gulf coast; three resulted from low areas on the Pacific coast, and two were first observed north of Dakota.

The following table shows the latitude and longitude at which each area was first and last observed, and the average hourly velocity of each.

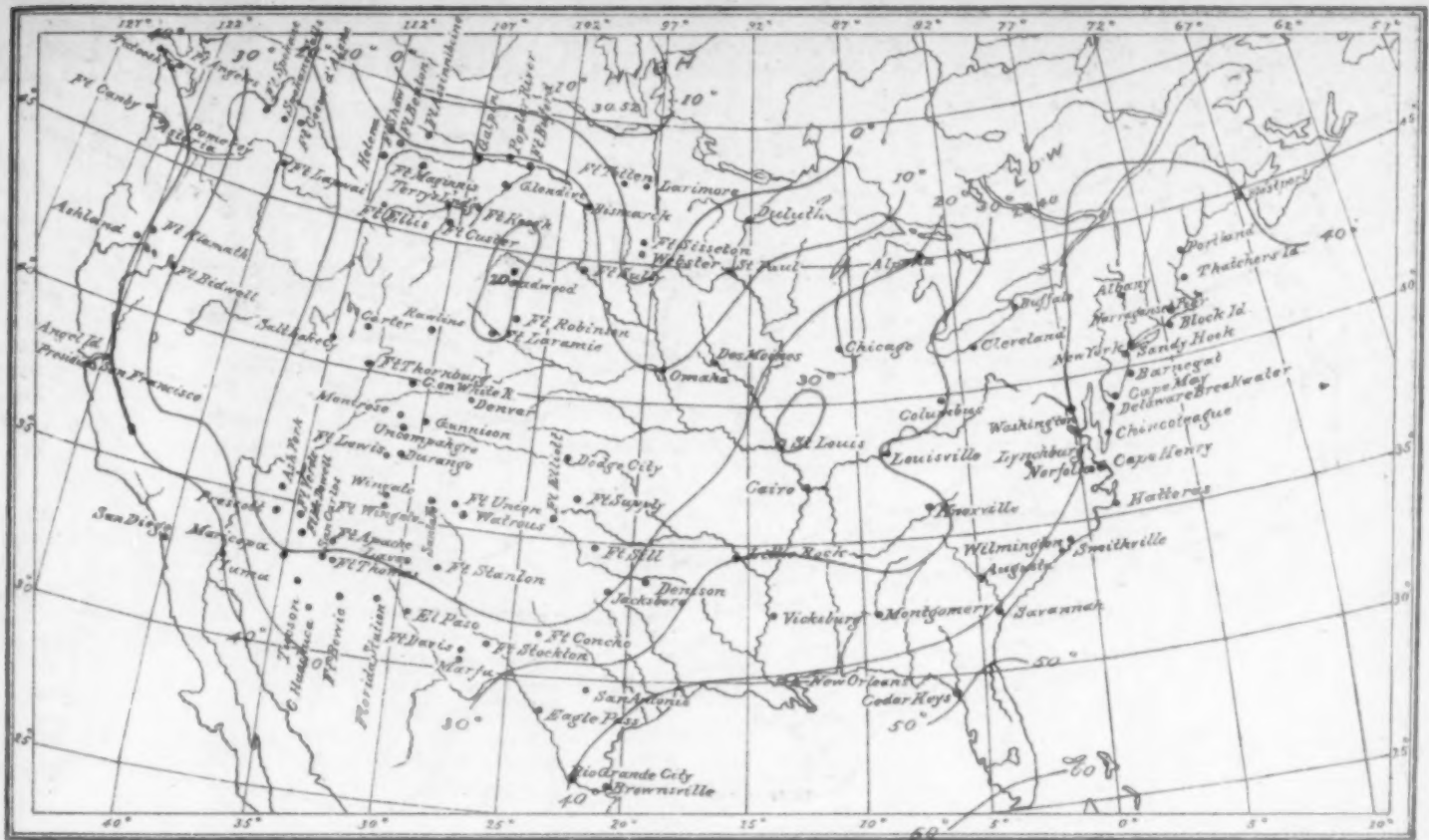
Low areas.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I.....	36 00	102 00	43 00	64 00	.....
II.....	39 00	95 00	47 00	63 00	20.0
III.....	27 00	98 00	51 00	66 00	34.0
IV.....	53 00	101 00	52 00	84 00	30.0
V.....	29 00	95 00	48 00	61 00	39.0
VI.....	37 00	92 00	49 00	61 00	52.0
VII.....	39 00	101 00	45 00	74 00	37.0
VIII.....	43 00	108 00	52 00	66 00	48.0
IX.....	29 00	97 00	37 00	85 00	23.0
X.....	50 00	124 00	53 00	101 00	47.0
XI.....	51 00	105 00	57 00	40 00	37.0

Mean hourly velocity, 36.7 miles.

I.—This area has been previously described in the REVIEW for December, 1885, it having originated in the Southwest and moved along the Atlantic coast to New England, where it was central on the morning of the 1st. This storm developed considerable energy along the New England coast before disappearing to the eastward over the Atlantic.

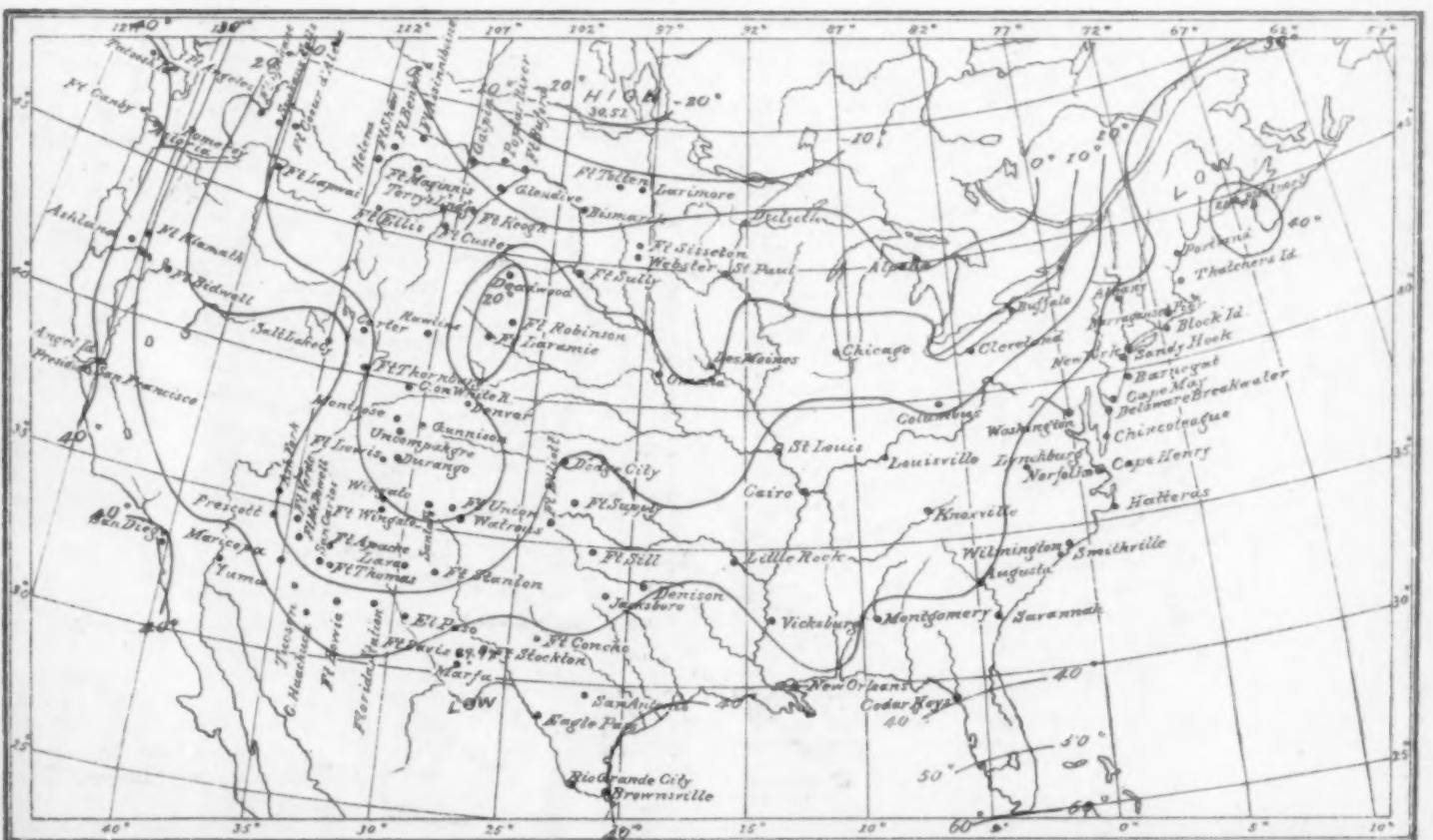
II.—When the preceding storm was passing along the New England coast this area was forming in the extreme southwest, or the lower Rio Grande valley, the barometer being low from the west Gulf coast westward to southern California, and high areas of 30.30 extended over the middle Atlantic states, Dakota, and the north Pacific coast. During the 2d this storm moved slowly northward over the west Gulf states, forming a trough-shaped depression which extended to the upper lake region, while the high area in the eastern portion of the country moved in the same direction to the lower Saint Lawrence valley. The high area referred to as central over Dakota was apparently crowded to the westward and became a part of that on the Pacific coast, which increased in intensity and became more clearly defined as a high area over the central plateau region. On the 2d the area of precipitation included all districts of the central valleys and the Lake region; the winds were strong and from the north in the eastern Rocky Mountain districts, and there was a marked contrast of temperatures in these districts when compared with temperatures observed in the Mississippi Valley. At midnight of the 2d the temperature at Saint Louis, Missouri, was 57°, while at Dodge City, Kansas, on about the same latitude, it was 13°. This storm passed over the Mississippi Valley during the 2d and 3d, and was central near Milwaukee, Wisconsin, on the morning of the

January 5, 1886—7 A. M.



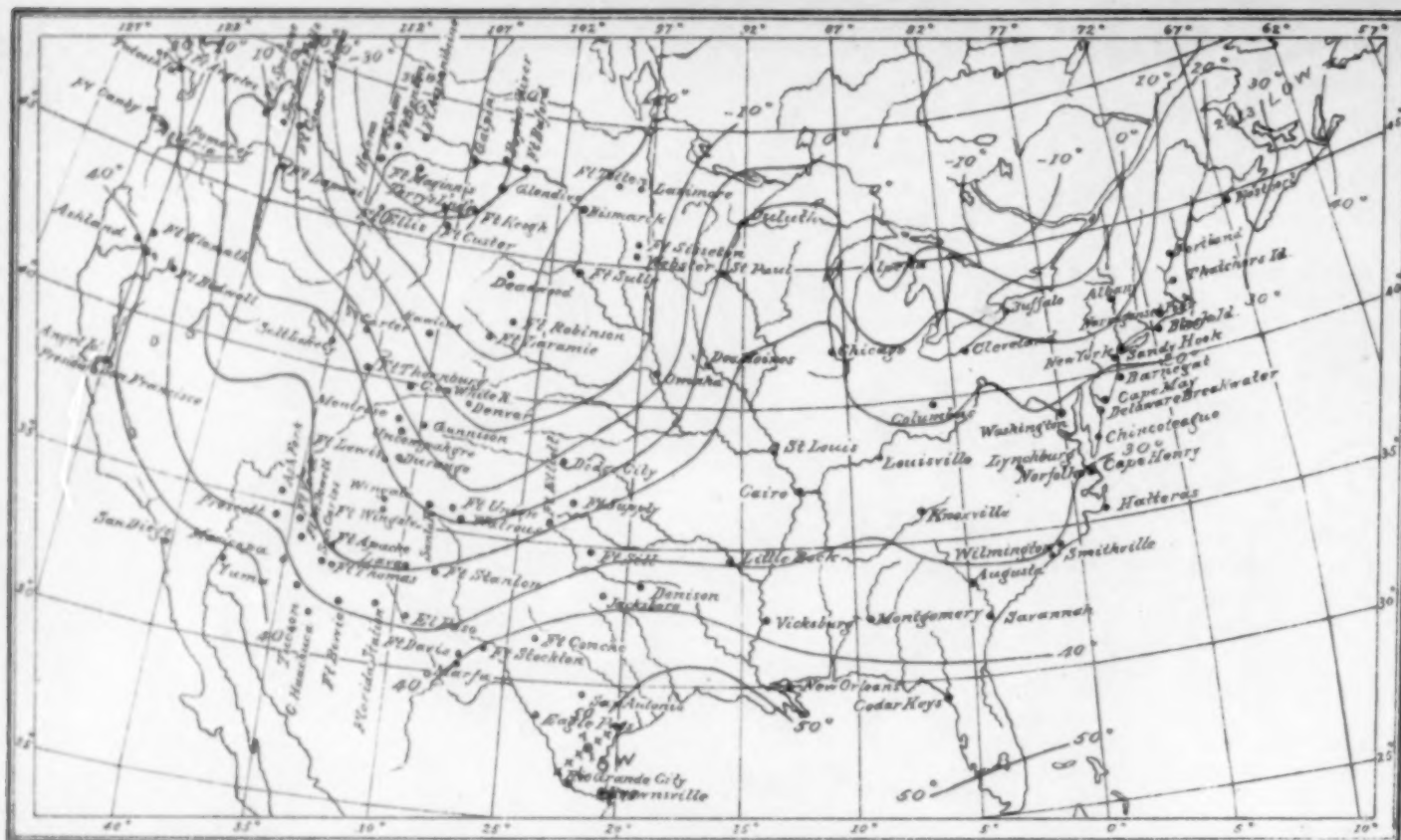
Signal Office Lath.

January 6, 1886—7 A. M.



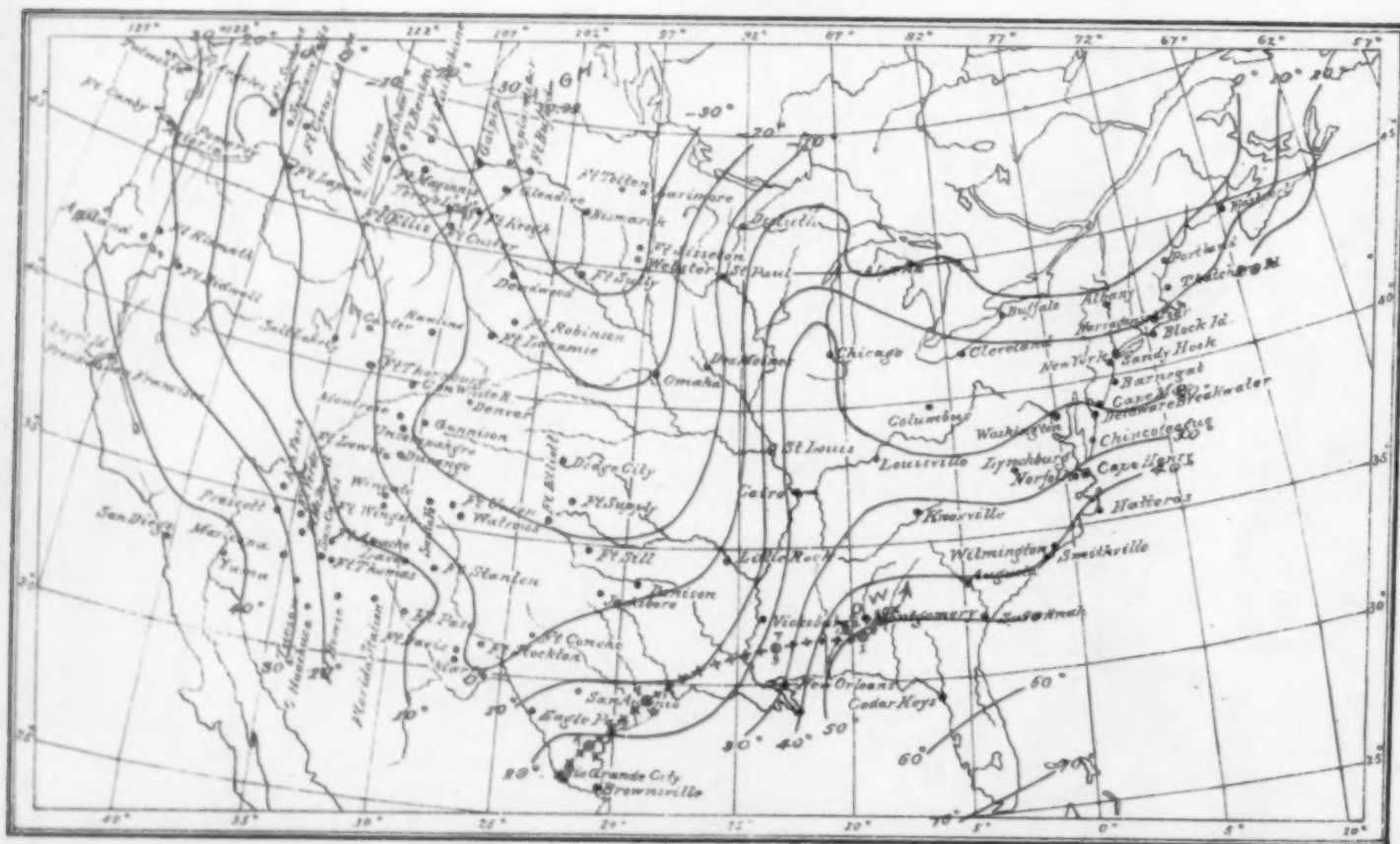
Signal Office Lath.

January 7, 1886—7 A. M.



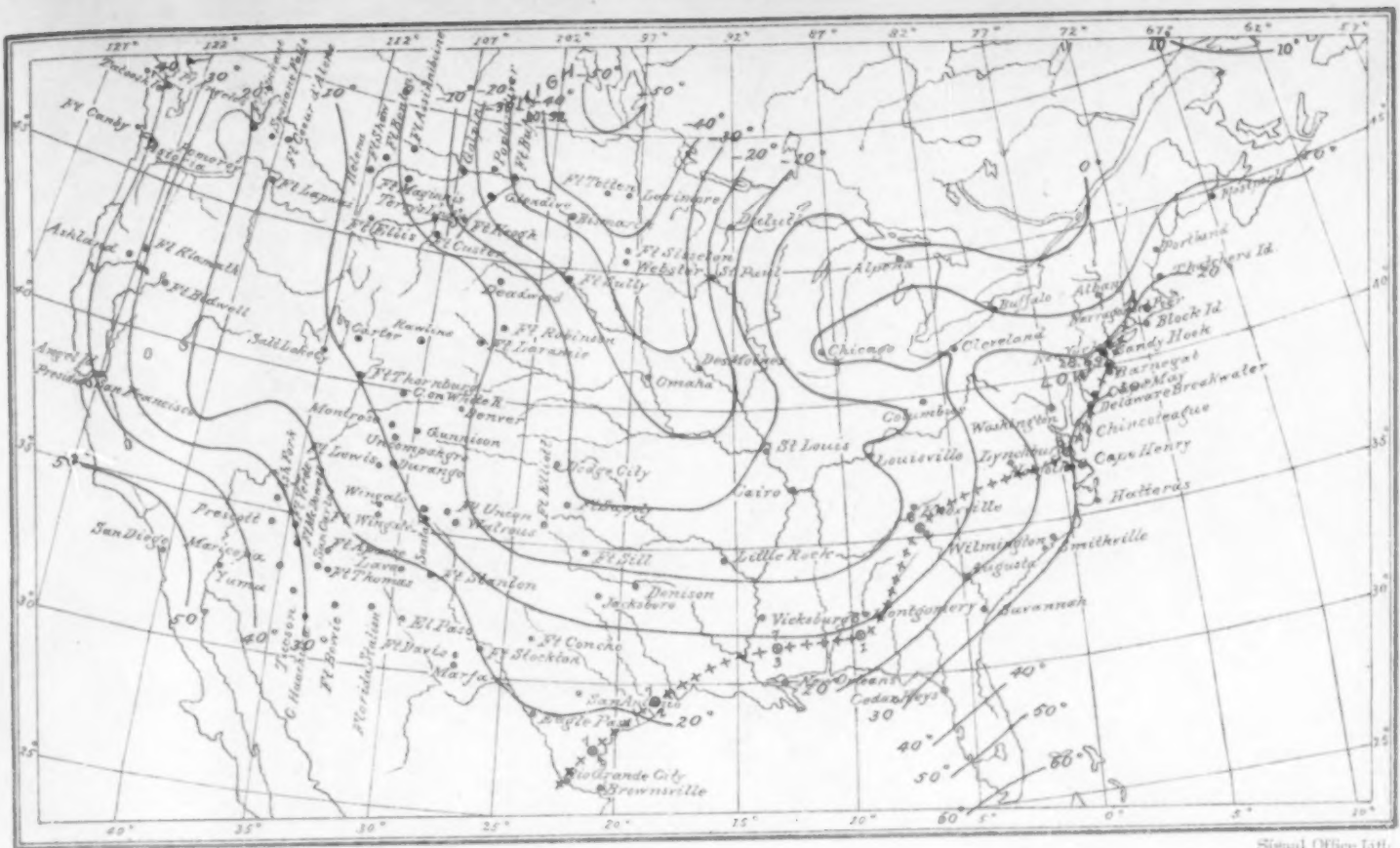
Signal Office L. H.

January 8, 1886—7 A. M.

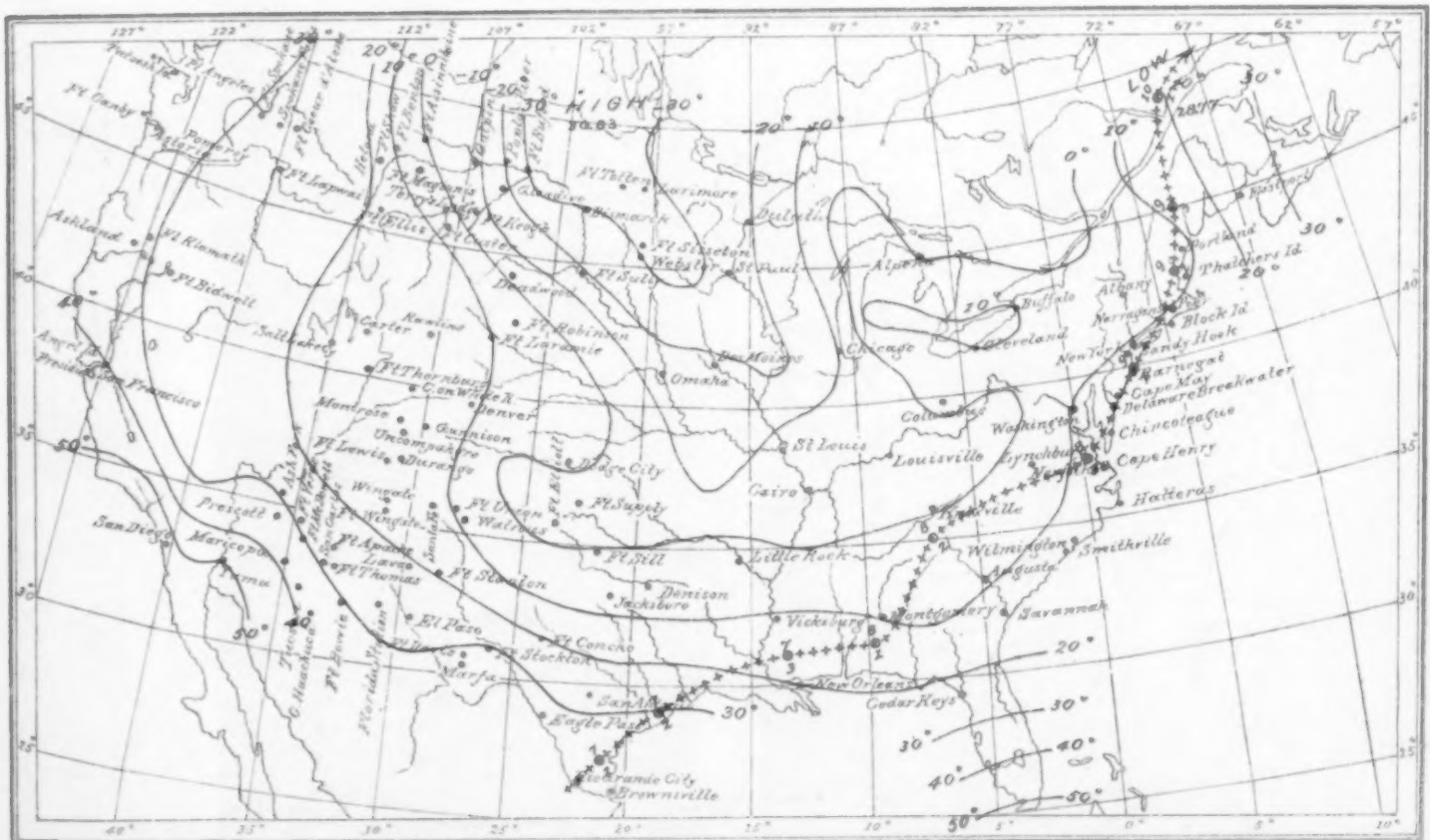


Signal Office L. H.

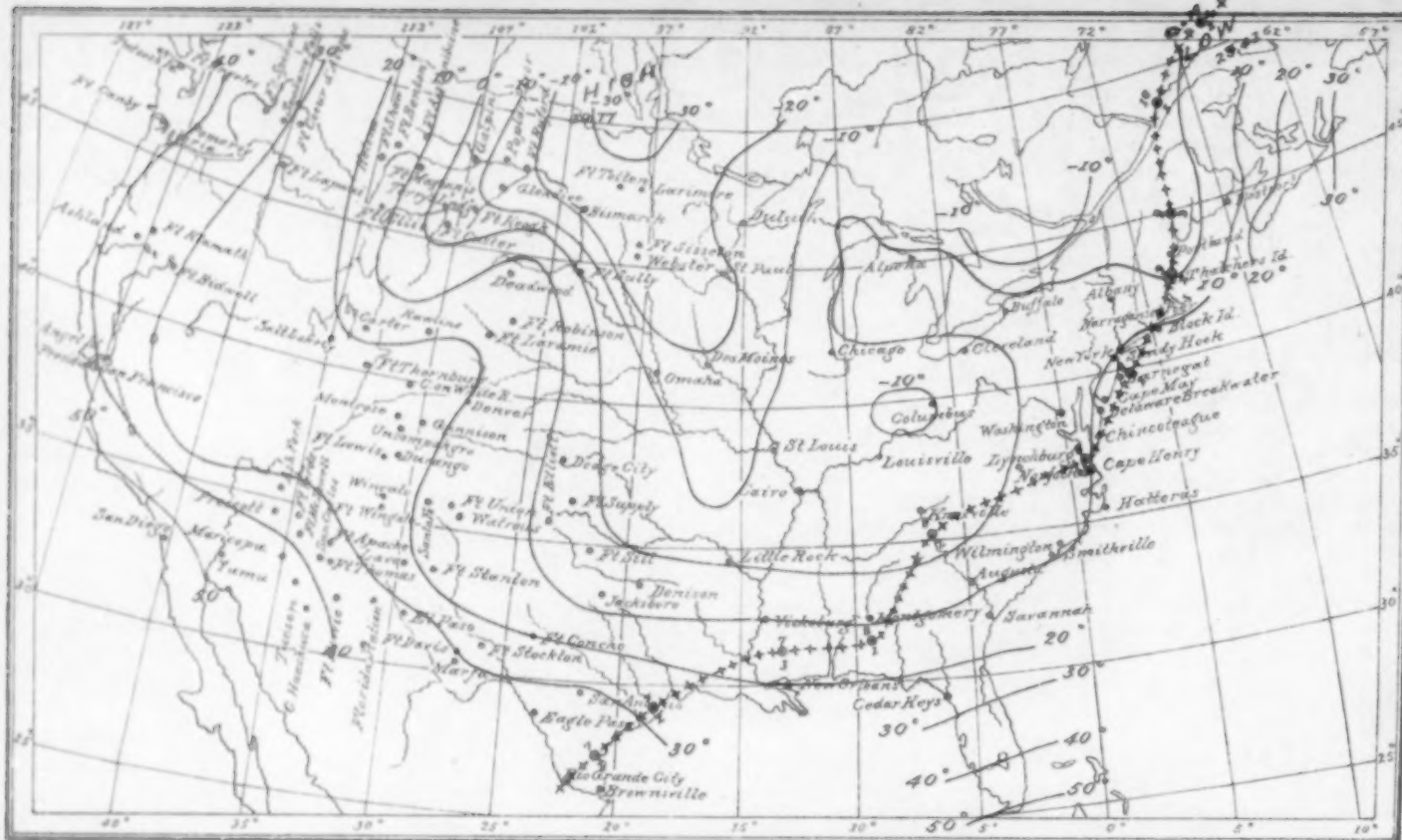
January 9, 1886—7 A. M.



January 10, 1886—7 A. M.

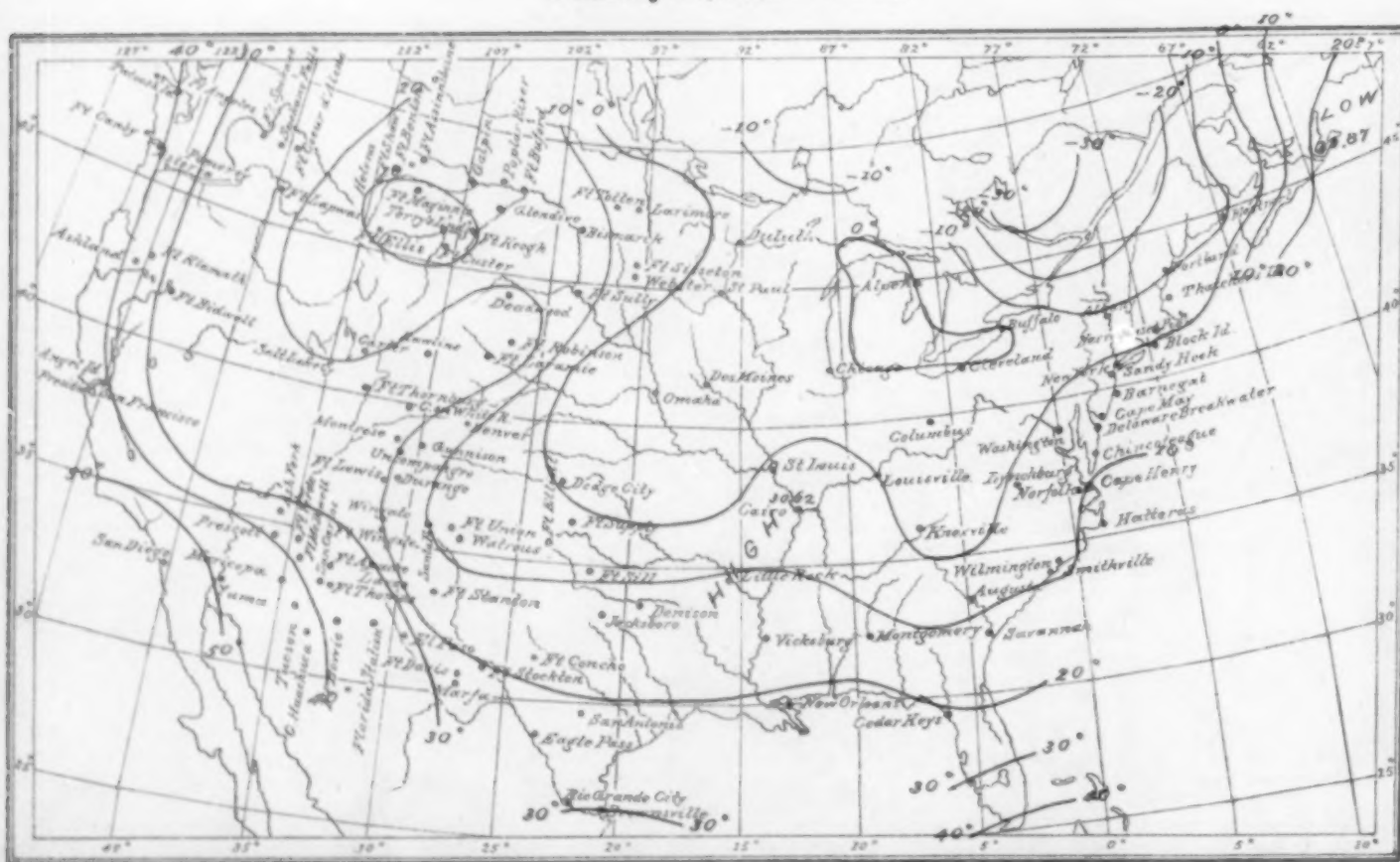


January 11, 1886—7 A. M.



Signal Office Lth.

January 12, 1886—7 A. M.



Signal Office Lth.

4th. This movement northward was retarded while the centre was passing to northern Illinois, and the trough at the south continued, thus leaving the barometer low along the track of the storm. After reaching Lake Michigan the form of the isobars changed, the central depression assuming an oval shape and extending from northeast to southwest; at the same time the storm increased greatly in energy, owing to the advance of the high area to the west. The course changed to easterly, which carried the centre over Lake Huron, but the afternoon chart of the 4th exhibited a secondary depression in the central Mississippi valley. Rain or snow fell in all districts east of the Rocky Mountains on the 4th, the snow extending southward over Tennessee and Arkansas. This storm developed great energy while moving over the Lake regions, the centre passing northeastward from Lake Huron until the morning of the 5th, when a secondary area (which developed in the barometric loop extending over the middle Atlantic states) became the principal centre of disturbance. During the 5th, 6th, and 7th this storm moved slowly northeastward over New England to the Gulf of Saint Lawrence, with increasing severity, the barometer falling at the centre as the storm advanced until it reached 29.17, at Chatham, New Brunswick, on the afternoon of the 7th. Severe gales occurred in the Lake regions, on the New England coast and in the Maritime Provinces. At Father Point, Province of Quebec, the wind reached a velocity of fifty miles per hour on the 7th.

III.—As in the preceding storm, this had its origin in the south of Texas. When the first cyclonic movement of the winds was observed on the west Gulf coast on the 7th, an unusually large area of high pressure covered the country from the lower lake region to the Pacific coast, the barometer being above 30.90 north of Dakota, and the cold wave had extended southward to northern Texas, where the temperature was below zero. This rapid flow of cold air apparently forced this low area to the east, and the increasing energy of the low area as it passed first eastward over the east Gulf states and then northeastward along the coast, apparently forced the cold air to the south and east over the Southern States with great rapidity. These conditions, it will be seen, were such as to favor the transfer of air without the loss of temperature, due to slow movements in the lower latitudes, and the reports as given of the cold wave show the lowest recorded temperatures in many places in the Gulf States and Florida. The barometer continued to fall at the centre of the storm as it moved with great violence northeastward along the Atlantic coast; at Boston, Massachusetts, it fell to 28.73 on the afternoon of the 9th, when the pressure was 30.80 in the extreme northwest. The gradient was steep in all directions; the storm was circular in form, and the lowest isobar about one hundred miles in diameter. The entire coast was warned of the approach of this storm, as were all stations warned of the approach of the cold wave which immediately followed. It passed directly north from Boston, Massachusetts, to Father Point, Province of Quebec, and thence northeast; the pressure remaining below 29.0 until after the 10th. Its maximum energy was developed while passing along the middle Atlantic coast, and as soon as it passed north of New England, the central area enlarged and the winds decreased in force as the cold air from the west passed to the east.

The following extracts from reports of Signal Service observers indicate the severity of this storm:

Fort Macon, North Carolina: a heavy gale occurred on the 8th, the wind reaching a velocity of sixty-two miles per hour from the southwest; the schooner "Cressie Wright" went ashore near Cape Lookout, North Carolina, and was totally wrecked; six of a crew of seven men were lost.

Norfolk, Virginia: the severest gale which has visited this section for years occurred on the 8-9th, causing detention of vessels and great damage on water and land.

Sandy Hook, New Jersey: a violent easterly, backing to northwesterly, gale began at 9 a. m. of the 9th, the barometer falling to 28.72; great damage was done to the track of the New Jersey Southern Railroad by the high water and heavy waves; several casualties to shipping were reported along the coast.

New York City: a heavy northeast gale, with snow, began at 10.40 p. m. of the 8th, and continued throughout the 9th and 10th, the wind reaching a ve-

locity of forty-four miles per hour up to 4.35 a. m. of the 9th, when the anemometer-cups were blown away; numerous disasters to shipping are reported on the adjacent coast.

New London, Connecticut: one of the most severe gales ever experienced at this station, together with a blinding snow storm, began at midnight of the 8th and continued throughout the 9th; numerous disasters to shipping occurred here and in this vicinity.

New Haven, Connecticut: a severe gale occurred on the 9th, the wind reaching a velocity of forty-four miles at 2 a. m. An unknown schooner sank, with all on board, off Charles Island, ten miles from this place.

Point Judith, Rhode Island: a severe gale began at midnight of the 8th and continued throughout the 9th, with great violence; the schooner "Allen Greene" went ashore about a mile from this place, and several vessels passed in a disabled condition.

Newport, Rhode Island: an unusually heavy gale occurred on the 8-9th; great damage was done to the wharves by the high water and heavy waves; the schooner "Mattie D." went ashore at this place and became a total wreck.

Provincetown, Massachusetts: a severe gale occurred on the 9-10th; it is estimated that more damage was done on this part of the coast than at any time within the past ten years.

Boston, Massachusetts: a heavy northeast gale, accompanied by snow, occurred on the 9th, the wind reaching a maximum velocity of sixty-four miles per hour. An immense amount of damage was done by this storm; two vessels were totally wrecked, and seven lives lost in Boston harbor, and it is estimated that forty vessels went ashore on the New England coast.

Eastport, Maine: the storm of the 9th was the most destructive that has passed over this section since the establishment of this station; it was attended by light snow and sleet and a low temperature; nineteen schooners were damaged in the bay, five of which were sunk; the damage sustained by vessels and wharves is estimated at about \$20,000.

IV.—This slight depression was at no time within the limits of the United States, and its centre could only be located approximately as it passed eastward far to the north of the Lake region; on the 13th it was central north of Minnesota, and on the afternoon of the 14th it had passed to the longitude of eastern Lake Superior, where it was last observed. It was unattended by any marked change in the weather conditions within the United States or Canada.

V.—When the preceding area was moving eastward north of the Lake region, number v was slowly forming to the south of Texas. The distribution of pressure being as follows: The high area (attending the cold wave), 30.80, was central over Nova Scotia, the barometer being generally above 30.40 east of the Mississippi Valley; a second high area extended over Montana and a low area was off the north Pacific coast. This low area advanced northward, separating the two high areas referred to above, and formed a barometric trough (similar to that mentioned in the description of number ii); the high area to the west increased as this storm moved northward to Lake Superior. The temperature rose in the eastern districts as the barometer fell, and a cold wave followed in the western districts, but the cold was not felt as far to the south nor was it as severe in the northern districts as that which followed low area number iii. This storm was most severe in the upper lake region, where the gradient to the west was greatest, the range of pressure being one inch in the northwest quadrant of this low area. When the centre reached Lake Superior the course changed to easterly, and the rate of movement so increased as to carry the centre over twenty degrees of longitude in twenty-four hours. It had reached the vicinity of Bird Rock, Gulf of Saint Lawrence, by midnight of the 17th, attended by gales at the northeast stations and decreasing pressure at the centre. When last observed, near Sydney, Nova Scotia, the barometer had fallen to 29.30 and below. It apparently passed over the north Atlantic as a severe storm.

VI.—This storm also originated in the Southwest when the barometer was high over the Missouri Valley and northward. It was first located as central in southern Missouri, but the barometer had been below the normal from the lower Mississippi valley westward to the Pacific coast, and a low area had extended over the central plateau regions and California. This western low area cannot be traced to the east of the Rocky Mountains, but it is probable that the existence of this low area favored the development of the disturbance to the east. It moved rapidly to the northeast from southern Missouri to the Saint Lawrence Valley, causing general snows or rain on the 18th and 19th, and was quickly followed by a cold wave

and clearing weather in the central valleys and Lake regions. The centre apparently passed from the upper Saint Lawrence Valley to the New England coast during the night of the 19th and then to the northeast of New England where the barometer fell .6 in eight hours.

VII.—The barometer was unusually low on the north Pacific coast during the afternoon of the 19th, while a high area and cold wave extended over the eastern slope of the Rocky Mountains. This low area moved eastward, and the isobars over the plateau regions indicated that low area number vii originated as a secondary disturbance over the central plateau region. It was first marked as in western Kansas on the morning of the 20th; from this section it advanced east and northeast, attended by general rains or snow. The barometer did not fall below 29.70 within this area, and the gradient was not rapid until it reached the Lake region. The strongest winds occurred when it was central in the lower lake region and immediately before it disappeared in the upper Saint Lawrence valley near Montreal, Province of Quebec.

VIII.—This disturbance originated as a secondary low area, and was first observed in the central Rocky Mountain region on the morning of the 21st. The principal disturbance, from which this and the preceding depression originated, remained west of the Rocky Mountains. The direction of movement was to the southeast during the first eight hours, and during the night of the 21st two low areas were observed, one central in Wisconsin and the other central in Indian Territory; the latter disappeared before the cold wave that followed the easterly movement of the former, which moved slowly over the upper lake region and then rapidly northeastward and disappeared over the Gulf of Saint Lawrence.

IX.—Previous to the appearance of this low area in the Southwest, a slight depression passed eastward from the northern Rocky Mountain region (and probably from the Pacific coast) over the Lake region, but its movements were not clearly defined and the depression was so slight that it has not been traced as a low area. Number ix became well defined as a low area central in southwestern Arkansas on the 26th, when a high area, attended by a cold wave, was central north of Manitoba. The barometer was about .3 above the normal for the month on the eastern slope of the Rocky Mountains, and a decided low area was advancing over the north Pacific. The cold air from the north apparently forced this depression to the eastward and caused it to disappear while central in eastern Tennessee, although succeeding reports indicate that a disturbance formed to the east of the south Atlantic coast immediately afterwards, and that this last-named disturbance followed the course of the Gulf Stream during the 28th and 29th, but the track of the storm could not be definitely given.

X.—This low area originated in the north Pacific and appeared as central near Olympia, Washington Territory, as a severe storm on the night of the 26th. The reports of the 27th and 28th indicate that this low area passed directly eastward, crossing the Rocky Mountains north of Montana, and gradually filling up as it approached the Lake region, where it disappeared without causing any change in the atmospheric condition of the eastern districts.

XI.—This low area was observed far to the north of Montana on the afternoon of the 29th, following the high area which had previously moved southwestward to the plateau regions. This area moved rapidly to the southeast during the 29th and 30th, following the Missouri Valley and crossing to the east of the Mississippi Valley as a well-defined low area, but it disappeared after reaching the Ohio Valley and could not be traced as a distinct depression after midnight of the 30th. The precipitation attending this depression was generally light, and the barometer fell as the depression moved to the southeast, the lowest reading being observed when the centre was near Indianapolis, Indiana. The disappearance of this depression within the limits of the stations of observation was probably due to the low area previously referred to as following the Gulf Stream. This storm was central near the New

England coast on the 30th, the barometer being below 29.40, and the outward flow of the upper air currents from this storm may have increased the supply of air over the low area to the west, thus causing it to disappear within the limits of the stations of observation.

NORTH ATLANTIC STORMS DURING JANUARY, 1886.

[Pressure expressed in inches and millimetres; wind-force by scale of 0-10.]

The tracks of the areas of low pressure that have appeared over the north Atlantic Ocean are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and special reports collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data, received at this office up to February 21, 1886.

The paths of seven areas of low pressure are shown on the chart for January, 1886. Of these, two, viz., numbers 5 and 6, are continuations of low areas which had previously passed over the United States and Canada; one, number 7, developed off the coast of Florida; number 1 appeared over the ocean in N. 46°, W. 40°; and the position of the remaining low areas, numbers 2, 3, and 4, are shown by a portion of their tracks in the northeast Atlantic near the coast of the British Isles.

The weather over the north Atlantic Ocean during January, 1886, was marked by frequent high winds and gales. The pressure over mid-ocean from the beginning of the month up to the 18th was generally high, while successive areas of low pressure took their course along the coasts of the United States and Canada, and also over the northeast Atlantic and the British Isles. From the 19th to the close of the month the pressure over mid-ocean and the European coast was comparatively low. Areas of high pressure occupied the ocean south of the Banks from the 19th to the 22d and from the 25th to the 28th.

The following are descriptions of the low areas charted:

1.—This area of low pressure first became well defined on the 2d, when the centre was near N. 46°, W. 40°, and the pressure, as reported by the s. s. "Schiedam," 29.74 (755.4); it had probably existed as a depression on the preceding day farther to the southward. This area moved eastward, and on the 3d its position is indicated by rains between N. 40° and 49° and W. 25° and 30°.

2.—This area of low pressure originated in high latitudes off the northeast coast of Europe, causing strong nw. gales over the northern portion of the British Isles on the 2d, accompanied by falling barometer. On the 3d the s. s. "Ethiopia," John Wilson, commanding, in N. 54° 40', W. 19° 00', reported strong w. to wnw. gales and heavy sea. The s. s. "Stockholm City," K. Doyle, commanding, in N. 58° 45', W. 4° 00', had a furious storm from w. and terrific squalls, with high seas, on the 3d, continuing on the 4th, when the barometer fell to 29.15 (740.4). The s. s. "Prinz Leopold," Wm. Rubarth, commanding, experienced a whole gale, setting in from the sw. on the 3d and continuing on the 4th, with falling barometer; in N. 59° 57', W. 5° 59', on the 4th, the barometer read 28.85 (732.8). This area moved steadily southward until on the 5th its approximate latitude is indicated on the chart at N. 54° and on the 6th at N. 50°, but without the necessary data from the land stations to determine with reliability the longitude of its path.

3.—This low area appeared off the west coast of Ireland on the 10th, and by the 11th had apparently moved eastward over Great Britain, as indicated by the following reports: The s. s. "Norseman," E. Maddox, commanding, in N. 50° 30', W. 8° 37', reported a fresh nw. to nne. gale and heavy squall on the 10th. The s. s. "Geiser," C. W. Möller, commanding, in N. 59° 10', E. 0° 42', had fresh gales with force 5 from se. on the 10th, veering to wsw. on the 11th and increasing to a force of 7, while the barometer fell to 28.95 (735.3). The s. s. "Durham

City," M. P. Lund, commanding, in N. 49° 45', W. 9° 59', had a strong gale from the w. and nw. on the 11th.

4.—This area of low pressure appeared off the northeast coast of the British Isles on the 16th, producing violent westerly gales, with a force of 7 to 8, over the British Isles, and over the ocean to the westward as far as W. 30°; the lowest reported barometer, at noon, Greenwich time, being 29.02 (737.1), in N. 58° 36', W. 8° 20'. The s. s. "Istrian," R. Leask, commanding, in N. 51°, W. 11° 30', had strong nw. gale, with high seas, on the 16th, continuing on the 17th, with increasing violence and falling barometer; the lowest reading of the barometer was 29.35 (745.5), in N. 50° 30', W. 15°, on the 17th. The s. s. "Assyrian Monarch," John Harrison, commanding, in N. 50°, W. 13° 20', reported a whole gale on the 16th, setting in from the nw., with barometer falling to 29.60 (751.8), on the 17th, in N. 49° 30', W. 16° 20'. Captain W. Rippeth, of the s. s. "Rialto," in N. 49° 20', W. 12° 34', reported barometer 29.40 (746.7), on the 17th, with the wind blowing a whole gale from the nw.

5.—This was a continuation of the storm described as number v under "Areas of low pressure" in this REVIEW. On the 17th the centre was over the Gulf of Saint Lawrence, with pressure at about 29.30 (744.2). On the 18th it had moved eastward to about N. 45°, W. 55°, where the pressure at noon, Greenwich time, was 29.14 (740.1); the barometric readings increasing on the southwest to 29.65 in N. 41°, W. 60°. Vessels to the south of the low centre had sw. to nw. gales with a force of 8, and hard seas. On the 19th the lowest readings were shown near N. 50°, W. 38°, where they ranged from 29.60 (751.8) to 29.80 (756.9), ships to the west experiencing gales of force 7 to 8. The s. s. "Jan Breydel," H. Meyer, commanding, in N. 49° 22', W. 30° 40', had squalls and high seas, with barometer at 29.60 (751.8). On the 20th, in N. 51°, W. 26°, the barometer had fallen to 29.40 (746.7), and on the 21st the low area had reached W. 20°, whence it moved southeasterly beyond the range of reported observations, or became merged with area number 6. On the 21st, 4 a. m., the s. s. "Iowa," S. Walters, commanding, in N. 48° 38', W. 26° 6', had moderating northeasterly winds and barometer 29.62 (752.3).

6.—This area was probably a continuation of the storm described as number vi under "Areas of low pressure" in this REVIEW. On the 20th the area was central over the Gulf of Saint Lawrence, where the pressure was about 29.50 (749.3). From this point it moved rapidly eastward and on the 21st was central in N. 51°, W. 40°. On that date the s. s. "Rhaetia," F. Vogelgesang, commanding, in N. 49° 12', W. 42° 30', reported westerly to northwesterly gales, with a force of 9, and barometer at 29.61 (752.1), attended by heavy snow squalls and very high westerly sea. The course of the low area then bent to the southeast and at noon of the 22d the s. s. "Iowa" had a fresh gale from the nw., with barometer at 29.42 (747.3), in N. 47° 12', W. 31° 41'; neighboring vessels had heavy squalls and high confused sea. The s. s. "St. Simon," E. Durand, commanding, in N. 46° 29', W. 33° 49', reported barometer 29.26 (743.2) at midnight of the 22d, and nw. wind, with force of 8. The s. s. "Rialto," in N. 47° 45', W. 29° 16', had light se. wind at 11 a. m., 22d, suddenly veering to nw. and increasing to a storm (force 9) at 3.30 p. m. During the 23d and 24th the area of low pressure moved eastward, and by 7 a. m. of the latter date reached W. 10°. The s. s. "Sidonian," B. Jamieson, commanding, in N. 37° 28', W. 17° 27', on the 24th, reported: "Gale continued strong from sw. to nw., with heavy squalls and rain, ship rolling heavily; lowest barometer, 29.59 (751.6), at 4 a. m." On the 25th the storm-centre had apparently passed eastward beyond W. 6°, where the barometer had fallen to 29.23 (742.4), and northerly winds prevailed.

7.—This low area first became well defined on the 27th, when its centre was near N. 32°, W. 75°, but it had apparently existed on the 25th and 26th, as indicated by the following reports: Bark "Kongsbyrd," G. Michalsen, commanding, "in N. 32° 21', W. 74° 41', on January 25th, experienced a strong

gale beginning from e. and ese.; on 26th it increased to a whole gale, backing to nne. in N. 35°, W. 75°." Captain W. H. Bennett of the s. s. "Craighill," off Jupiter Inlet, Florida, on the 26th, had nw. gale, barometer 29.72 (754.9), and very heavy sea from n. This low area moved northeastward in a course approximately parallel to the coast and with increasing velocity. By the 30th it had reached N. 46° and thence passed beyond the region of observation. At 4.10 p. m. on that date the s. s. "Craighill," in N. 37° 42', W. 71° 44', had barometer 29.36 (745.7), with strong gale backing from wnw. to sw.

In addition to the gales connected with the above series of low areas charted over the north Atlantic, the ship reports contain accounts of numerous gales caused by areas of low pressure whose tracks have been within the coast lines of Europe and North America and beyond the region of observation on the sea. Among such, the most important, by reason of their violence and destructiveness, were the gales off the Atlantic coasts of the United States from the 8th to the 11th, during the passage of the extraordinary low area described as number iii in this REVIEW.

The following are a few of the vessel reports relative to this storm:

The s. s. "Britannic," H. Perry, commanding, in N. 40° 30', W. 71° 40', reports barometer reading 28.95 (735.3), on the 9th, with violent gale blowing from the e. and shifting to the sw. Captain Joseph Baxter, of the American bark "Ralph M. Hayward," in N. 39° 27', W. 72° 76', reports, "a perfect hurricane, with heavy seas, on the 9th." S. S. "Trinidad," W. J. Frazer, commanding, reports wind blowing in squalls, with hurricane force, from 8th to 10th, in N. 36°, W. 69° 30'.

The s. s. "Caracas," Captain W. M. Hopkins, commanding, reports a hurricane on the 9th while in N. 37° 10', W. 73° 59'; the wind, which at the beginning of the storm was east-southeast, shifted to west-northwest, and was accompanied by a tremendous high and confused sea.

The s. s. "Hylton Castle" (Br.), William Colvin, commanding, sprung a leak in the hurricane of January 8th, while in N. 41° 19', W. 72° 45'. The wind, northeast at the beginning of the storm, shifted very suddenly to the southwest. On the 11th all hands left the vessel, which went down shortly after, fifteen miles southeast of Fire Island.

On the 10th the s. s. "Ethiopia," in N. 44° 56', W. 54° 25', had a strong s. gale, high confused sea, and heavy south swell.

The s. s. "Lessing" reported on the 11th, "very strong gale from sse. to sw.; dangerous sea and heavy rain-squalls."

The following are a portion of the wrecks reported during this storm:

Schooner "Juliet" was driven on the rocks near Deer Island, and the captain, mate, and cook were drowned.

Schooner "Clio Chilcott" went ashore in Block Island Sound; one man lost.

Schooner "Millie Trim," Olsen, went ashore on Calf Island, and became a total wreck. All hands, except the captain, were drowned.

Schooners "James Riley," "Zingara," and "Joseph Allen" went ashore at Kedge's Straits.

Schooner "Crazy Jane" was wrecked on Robbin's Island.

Schooners "Sappho" and "Seven Brothers" were wrecked at Gardiner's Bay, Long Island.

Schooner "L. M. Quillin" sunk in Albemarle Sound.

From the 29th to the 31st, vessels off the English coast had gales due to an area of low pressure whose track was apparently beyond the limits of the chart. The s. s. "Chicago," J. W. Jones, commanding, in N. 49° 22', W. 9° 10', had a strong westerly gale, beginning on the 29th and continuing to the 31st, when the barometer, at 12 noon, had fallen to 29.66 (753.4).

The s. s. "Denmark," R. S. Rigby, commanding, in N. 49° 30' and W. 14° to 20°, from the 29th to the 31st, experienced strong westerly gales, violent squalls, and heavy rough sea, with barometer at 29.70 (754.4).

The s. s. "Milanese," in the English Channel, on the 30th, had strong wsw. gales and high seas, continuing with heavy squalls on the 31st.

OCEAN ICE.

The only icebergs reported during the month were on the southeast coast of Newfoundland, and their position is indicated on chart i by shaded spots. These are undoubtedly the same as those reported in December off the entrance to Saint John's Harbor.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York City and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to ship-masters.

In pursuance of the arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during January, 1886, eleven reports concerning storms encountered by vessels in the Atlantic west of the forty-fifth meridian; two message was sent from Boston.

TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada for January, 1886, is exhibited on chart ii by the dotted isothermal lines; and in the tables of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service.

In the following table are given the mean temperatures for the several geographical districts, with the normals and departures, as deduced from Signal Service observations:

Average temperatures for January.

Districts.	Average for Jan. Signal-Service ob- servations.		Comparison of Jan., 1886, with the average for several years.
	For sev- eral years.	For 1886.	
New England.....	25.5	24.8	-0.7
Middle Atlantic States.....	33.3	30.0	-3.3
South Atlantic States.....	40.7	40.8	-5.9
Florida Peninsula.....	60.8	54.2	-6.6
Eastern Gulf States.....	48.4	40.7	-7.7
Western Gulf States.....	46.6	39.4	-7.2
Rio Grande Valley.....	52.9	52.8	-4.4
Tennessee.....	39.5	31.1	-8.4
Ohio Valley.....	31.7	25.9	-5.8
Lower Lake region.....	25.6	22.0	-3.6
Upper Lake region.....	18.1	15.5	-2.6
Extreme Northwest.....	2.4	-4.1	-6.5
Upper Mississippi Valley.....	22.8	15.7	-7.1
Missouri Valley.....	17.3	6.8	-10.5
Northern slope.....	17.7	10.4	-7.3
Middle slope.....	24.9	19.3	-5.6
Southern slope.....	39.4	35.0	-4.4
Southern plateau.....	40.4	41.0	+0.6
Middle plateau.....	29.0	30.7	+1.7
Northern plateau.....	25.8	25.3	-0.5
North Pacific coast region.....	39.3	38.0	-1.3
Middle Pacific coast region.....	47.5	47.7	+0.2
South Pacific coast region.....	53.1	54.9	+1.8

In the Canadian Maritime Provinces, northern New England, California, and over the western portions of the middle and southern plateau districts, the monthly mean temperatures were above the normal, the departures being greatest in the Canadian Maritime Provinces, where they were from 4° to 6°; over the plateau districts and California the departures were below 3°. In all other districts the mean temperatures were below the normal, the departures ranging from 4° to 10° over the greater part of the country to the eastward of the Rocky Mountains. The district showing the greatest departure below the normal temperature is the Missouri Valley, where the average (four stations) is 10°.5; over the northern slope, Tennessee, and the Gulf States the average departures ranged from 7° to 8° in the west Gulf states, to 8° in Tennessee. In the Atlantic coast districts the average departures below the normal temperature increased from less than 1° in New England to 3°.

in the middle Atlantic states, 5° in the south Atlantic states, and to 6° in Florida. Over the middle and southern Rocky Mountain slopes and Rio Grande Valley the temperature averaged about 5° below the normal.

The following are some of the most marked departures reported from Signal Service stations:

Above normal.	Below normal.
Mount Washington, New Hampshire..... 6.4	Omaha, Nebraska..... 13.1
Sydney, Nova Scotia..... 6.4	Little Rock, Arkansas..... 12.5
Charlottetown, Prince Edward Island..... 5.7	Leavenworth, Kansas..... 11.2
Halifax, Nova Scotia..... 5.6	Memphis, Tennessee..... 10.8
Frederickton, New Brunswick..... 4.5	Fort Assinaboine, Montana..... 10.4
Eastport, Maine..... 3.3	Poplar River, Montana..... 10.1
Winnemucca, Nevada..... 2.9	Cairo, Illinois..... 9.7
Prescott, Arizona..... 2.8	Vicksburg, Mississippi..... 9.6
Los Angeles, California..... 2.1	Nashville, Tennessee..... 9.5

RANGES OF TEMPERATURE.

The monthly, and the greatest and least monthly ranges of temperature, are given in the tables of miscellaneous meteorological data.

The following are some of the greatest and least monthly ranges:

Greatest.	Least.
Fort Benton, Montana..... 100.1	San Francisco, California..... 26.5
Fort Assinaboine, Montana..... 95.4	Cape Mendocino, California..... 27.4
Fort Buford, Dakota..... 92.3	Fort Canby, Washington Territory..... 30.5
Helena, Montana..... 91.9	Tatoosh Island, Washington Territory..... 32.0
Polar River, Montana..... 90.1	Pysht, Washington Territory..... 32.0
Valentine, Nebraska..... 87.1	Red Bluff, California..... 34.5
Fort Maginnis, Montana..... 82.9	Sacramento, California..... 34.7
Denver, Colorado..... 81.7	Astoria, Oregon..... 35.0

DEVIATIONS FROM NORMAL TEMPERATURES.

In the table below are given, for certain stations, as reported by voluntary observers, the normal temperatures for January for a series of years, the mean temperature for January, 1886, and the departures from the normal:

Station.	County.	Normal tem- perature for January.	Number of years.	Mean tem- perature for Jan., 1886.	Departure.
Arkansas.					
Lead Hill.....	Boone.....	29.6	4	24.2	-5.4
California.					
Princeton.....	Colusa.....	45.8	14	47.7	+1.9
Sacramento.....	Sacramento.....	45.4	20	46.6	+1.2
Connecticut.					
Hartford.....	Hartford.....	33.4	2	33.4	0.0
Middletown.....	Middletown.....	24.9	28	22.9	-2.0
New Haven.....	New Haven.....	26.7	100	25.3	-1.4
New London.....	New London.....	28.2	16	27.8	-0.4
Dakota.					
Webster.....	Day.....	1.8	3	0.0	-1.8
Illinois.					
Anna.....	Union.....	32.5	11	24.3	-8.2
Mattoon.....	Coles.....	25.3	6	21.5	-3.8
Riley.....	McHenry.....	17.2	23	14.4	-2.8
Swanwick.....	Perry.....	25.1	4	22.1	-3.0
Indiana.					
Lafayette.....	Tippecanoe.....	23.2	7	19.1	-4.1
Logansport.....	Cass.....	20.2	31	22.7	+2.5
Mauzy.....	Rush.....	21.0	6	19.2	-1.8
Spiceland.....	Henry.....	26.0	32	31.9	+5.9
Vevay.....	Switzerland.....	31.4	21	27.3	-4.1
Iowa.					
Cresco.....	Howard.....	10.1	10	4.5	-5.6
Monticello.....	Jones.....	15.4	32	9.8	-5.6
Muscatoine.....	Muscatoine.....	19.3	46	14.2	-5.1
Kansas.					
Fort Scott.....	Bourbon.....	25.8	7	21.2	-4.6
Independence.....	Montgomery.....	27.7	14	18.6	-9.1
Wellington.....	Sanmer.....	25.0	8	17.6	-7.4
Yates Centre.....	Woodson.....	23.2	6	15.8	-7.4
Maine.					
Belfast.....	Waldo.....	18.9	27	30.8	+11.9
Bridgeton.....	Somerset.....	17.1	11	15.9	-1.2
Eastport.....	Washington.....	19.8	13	22.9	+3.1
Gardiner.....	Kennebec.....	17.8	50	19.4	+1.6
Orono.....	Penobscot.....	15.4	18	18.0	+2.6
Maryland.					
Fallston.....	Harford.....	29.9	15	26.6	-3.3
Massachusetts.					
Amherst.....	Hampshire.....	23.3	49	23.7	+0.4
Cambridge.....	Middlesex.....	24.9	64	24.2	-0.7
Fitchburg.....	Worcester.....	22.3	29	21.7	-0.6
Lowell.....	Middlesex.....	23.8	10	23.9	+0.1
New Bedford.....	Bristol.....	25.3	74	27.2	+1.9
Somerset.....	Bristol.....	26.2	16	26.5	+0.3

Deviations from normal temperatures—Continued.

Station.	County.	Normal temperature for January.	Number of years.	Mean temperature for Jan., 1886.	Departure.
<i>Massachusetts—Continued.</i>					
Springfield	Hampden	25.9	19	23.6	-2.3
Williamstown	Berkshire	21.5	33	19.7	-1.8
Worcester	Worcester	25.7	45	21.9	-3.8
<i>New Brunswick.</i>					
Saint John	Saint John	18.1	36	21.0	+2.9
<i>New Hampshire.</i>					
Concord	Merrimack	21.4	19	23.4	+2.0
Hanover	Grafton	16.3	22	16.2	-0.1
<i>New York.</i>					
Plattsburg Barracks	Clinton	16.8	17	16.4	-0.4
Factoryville	Tioga	20.4	4	20.1	-0.3
Palermo	Oswego	21.0	33	17.5	-3.5
North Volney	Oswego	21.7	18	18.0	-3.7
<i>Ohio.</i>					
Wauseon	Fulton	22.9	16	19.0	-3.9
<i>Pennsylvania.</i>					
Dyberry	Wayne	21.0	22	19.9	-1.1
<i>Rhode Island.</i>					
Providence	Providence	26.9	52	26.2	-0.7
<i>Texas.</i>					
New Ulm	Austin	50.3	13	43.6	-6.7
<i>Vermont.</i>					
Lunenburg	Essex	15.5	38	15.0	-0.5
Newport	Orleans	14.7	11	14.8	+0.1
<i>Virginia.</i>					
Stratford	Orange	16.0	11	15.9	-0.1
<i>West Virginia.</i>					
Bird's Nest	Northampton	39.7	18	35.4	-4.3
Dale Enterprise	Rockingham	28.8	6	28.2	-0.6
Variety Mills	Nelson	34.7	9	28.7	-6.0
Wytheville	Wythe	34.7	21	29.1	-5.6
<i>West Virginia.</i>					
Helvetia	Randolph	32.6	10	29.0	-3.6

* From the "Bulletin of the New England Meteorological Society."

The following notes on temperature are given by voluntary observers:

Arkansas.—Lead Hill, Boone county: the severe cold from the 8th to the 13th caused great suffering and some loss to stock.

Georgia.—Forsyth, Monroe county: the thermometer read lower on December 30, 1880, and as low on January 6, 1884, but the mean temperature of the 11th was 5° lower than it has been in the past twelve years.

Indiana.—Logansport, Cass county: the maximum temperature that has occurred in January during the past thirty-one years was 72°, in 1876, and the minimum, -30°, in 1873; the highest mean temperature was 43°, in 1880, and the lowest, 10°, in 1875.

Mauzy, Rush county: the highest mean temperature that has occurred in January in the past six years was 28°.2, in 1882, and the lowest, 16°.0, in 1884.

Iowa.—Monticello, Jones county: the maximum temperature that has occurred in any January during the past thirty-two years was 62°, in 1855, and the minimum, -33°, in 1884.

Maryland.—Fallston, Harford county: the highest January mean temperature, 40°.1, occurred in 1880, and the lowest, 25°.0, in 1881.

Massachusetts.—Worcester, Worcester county: from the records of the preceding forty-seven years the extremes of temperature in January are -18°, in 1880, and 64°.5, in 1876; the coldest day was in 1882, with a mean of -8°.5; the warmest days were in 1841 and 1848, with a mean each day of 53°; the coldest January was in 1857, the mean being 15°.9, and the warmest was in 1882, when the mean for the month was 33°.6.

Missouri.—Springfield, Greene county: the mean temperature for January, 21°.5, is the lowest ever recorded at this place.

New York.—North Volney, Oswego county: the coldest January occurred in 1881, the mean being 15°.1; the highest mean was 31°.8, in 1880.

Ohio.—Wauseon, Fulton county: the highest January mean for a period of sixteen years was 37°.7, in 1880, and the lowest, 12°.2, in 1875; the extremes during this period were 69°.5, in 1876, and 31°.7, in 1884.

Texas.—New Ulm, Austin county: the highest January mean temperature for the past thirteen years was 63°.7, in 1880, and the lowest, 43°.2, in 1881; the extremes for January during this period were 84°.0, in 1880, and 7°.0, in 1886.

Virginia.—Wytheville, Wythe county: the minimum temperature for January, 2°.0, was lower than any previous January for the past twenty-one years.

Variety Mills, Nelson county: the month was remarkable for its low temperature; the minimum, -12°.5, has been exceeded but once during the last eleven years, viz., December 31, 1880, when the thermometer fell to -16°.0.

FROSTS.

Frosts occurred in the various states and territories during the month, as follows:

New England.—1st to 4th, 6th to 31st.

Middle Atlantic states.—1st to 31st.

South Atlantic states.—1st, 4th to 31st.

Florida Peninsula.—6th to 14th.

East Gulf states.—1st, 4th to 25th, 29th, 30th, 31st.

Table of comparative maximum and minimum temperatures for January.

State or Territory.	Station.	For 1886.		Since establishment of station.		
		Max.	Min.	Max.	Year.	Min.
Alabama	Mobile	68.3	11.0	78.0	1882	13.9
Do	Montgomery	66.1	5.4	78.5	1882	8.0
Arizona	Prescott	60.0	8.0	71.0	1882	17.0
Do	Fort Apache	63.7	9.5	67.0	1882	5.0
Arkansas	Fort Smith	64.0	6.9	69.3	1882	5.0
Do	Little Rock	61.0	4.8	78.0	1880	3.5
California	San Francisco	67.5	41.0	69.0	1877	30.0
Do	Los Angeles	75.3	32.0	82.0	1881	30.0
Colorado	Denver	62.8	18.9	67.0	1882	30.0
Do	Pike's Peak	18.9	29.8	30.0	1879	37.0
Connecticut	New Haven	52.4	6.9	63.0	1876	14.0
Do	New London	49.9	3.3	65.0	1880	2.0
Dakota	Fort Buford	44.1	18.2	47.0	1880	46.0
Do	Yankton	43.1	27.5	67.0	1880	32.0
Delaware	Cape Henlopen	59.7	6.4			
Do	Del. Breakwater			60.0	1880	9.0
District of Columbia	Washington City	59.9	1.2	71.0	1874, 1876	14.0
Florida	Jacksonville	72.9	15.3	80.0	1875, 1876	21.6
Do	Key West	79.2	40.8	90.0	1877	48.0
Georgia	Atlanta	59.9	2.4	73.0	1879, 1882	1.3
Do	Savannah	70.0	12.0	80.0	1879	18.0
Idaho	Boise City	53.3	1.3	59.2	1885	7.3
Do	Lewiston			59.0	1880	14.2
Illinois	Calro	57.2	9.0	70.0	1876, 1880	16.0
Do	Chicago	48.3	14.4	65.0	1876	18.5
Indiana	Indianapolis	55.3	15.0	69.0	1876	25.0
Indian Territory	Fort Sill	68.0	5.0	75.0	1880	9.0
Iowa	Dubuque	37.8	23.1	62.0	1874	26.2
Do	Keokuk	52.3	18.7	64.0	1874	24.0
Kansas	Dodge City	44.0	16.2	70.0	1876	20.0
Do	Leavenworth	45.5	20.5	65.0	1876	29.0
Kentucky	Louisville	61.9	7.5	71.0	1876	19.5
Louisiana	New Orleans	71.9	15.3	78.0	1879	20.0
Do	Shreveport	69.9	1.3	78.0	1876, 1880	6.0
Maine	Eastport	46.1	14.9	51.0	1874	20.0
Do	Portland	47.8	12.4	58.0	1876	11.5
Maryland	Baltimore	56.7	2.5	71.0	1876	6.0
Massachusetts	Boston	53.6	10.1	69.5	1876	13.0
Michigan	Detroit	55.1	3.5	65.0	1876	20.0
Do	Marquette	35.4	17.8	56.0	1880	26.0
Minnesota	Duluth	31.2	31.7	51.0	1877	41.2
Do	Saint Paul	30.0	33.9	49.0	1879	35.6
Mississippi	Vicksburg	72.3	3.1	80.0	1879	10.0
Missouri	Saint Louis	60.0	8.2	72.0	1880	21.5
Montana	Fort Benton	49.1	51.0	58.0	1880	55.0
Do	Helena	49.3	30.2	57.0	1885	34.0
Nebraska	North Platte	52.0	21.2	70.0	1880	27.0
Do	Omaha	41.8	24.1	62.0	1879, 1880	32.0
Nevada	Winnemucca	57.0	2.4	57.0	1876	14.0
New Hampshire	Mount Washington	37.5	36.6	42.0	1874	50.0
New Jersey	Atlantic City	52.8	2.1	64.0	1880	3.0
Do	Sandy Hook	52.1	4.1	63.4	1885	3.0
New Mexico	Santa Fe	48.0	6.5	70.0	1879	13.0
New York	Buffalo	57.6	1.4	65.5	1874	13.5
Do	New York City	53.9	3.0	64.0	1876, 1880	6.0
North Carolina	Charlotte	63.0	0.6	71.0	1885	5.0
Do	Wilmington			77.0	1879	9.0
Ohio	Cincinnati	56.6	12.4	69.0	1876	10.0
Do	Toledo	53.2	11.4	66.0	1873, 1876	14.0
Oregon	Portland	60.0	15.0	59.2	1884	3.0
Do	Roseburg	62.2	22.7	66.0	1885	12.0
Pennsylvania	Philadelphia	58.1	3.9	67.0	1876	5.0
Do	Pittsburg	60.6	4.8	75.0	1874	12.0
Rhode Island	Block Island	52.1	0.9	58.8	1885	4.0
South Carolina	Charleston	70.3	10.5	80.0	1879	13.0
Tennessee	Knoxville	60.8	6.0	74.0	1876	10.0
Do	Nashville	58.9	9.0	74.0	1870	10.2
Texas	Fort Davis	73.3	3.2	77.0	1880	0.0
Do	Galveston	68.7	11.0	75.0	76, 80, 82	20.0
Utah	Salt Lake City	52.8	2.0	54.0	1879	20.0
Virginia	Lynchburg	65.0	2.7	73.0	1876, 1879	4.0
Do	Norfolk	63.2	9.4	80.0	1871	8.0
Washington Ter.	Dayton			62.0	1885	23.5
Do	Olympia	51.5	15.1	59.0	1885	9.0
Wisconsin	La Crosse	36.7	25.6	59.0	1874	43.0
Do	Milwaukee	45.1	21.8	59.0	1871, 1874	25.0
Wyoming	Cheyenne	51.4	27.0	63.0	1880	38.0

West Gulf states.—2d to 13th, 16th, 19th to 25th, 27th to 31st.

Rio Grande Valley.—Brownsville, Texas, 8th; Rio Grande City, Texas, 8th, 9th; Fort McIntosh, Texas, 12th.

Tennessee.—1st, 3d to 31st.

Ohio Valley.—1st to 26th, 28th to 31st.

Lower lake region.—1st to 31st.

Upper lake region.—1st to 31st.

Extreme northwest.—1st to 31st.

Upper Mississippi Valley.—1st to 31st.

Missouri Valley.—1st to 31st.

Northern slope.—1st to 31st.

Middle slope.—1st to 31st.

Southern slope.—3d, 5th, 6th, 11th, 12th, 14th to 19th, 21st to 24th, 27th, 28th, 29th, 31st.

Southern plateau.—2d to 10th, 15th, 19th, 22d, 23d, 26th to 31st.

Middle plateau.—1st to 31st.

Northern plateau.—1st to 4th, 7th to 12th, 16th.

North Pacific coast region.—1st to 12th; 14th to 24th.

Middle Pacific coast region.—1st to 16th, 18th.

South Pacific coast region.—2d to 8th.

ICE.

Ice formed in the southern part of the country, as follows:

Alabama.—Birmingham, 8th to 14th; Greensborough, 9th to 13th.

Arizona.—Tucson, 9th; Yuma, 2d, 3d, 4th.

California.—Los Angeles, 2d to 6th.

Florida.—Archer, 6th to 14th; Merritt's Island and Limona, 10th, 11th, 12th; Manatee, 12th; Sanford, 10th; Jacksonville, 9th, 10th; Cedar Keys, 11th, 12th, 13th.

Georgia.—Forsyth, 13th; Quitman, 9th to 13th; Atlanta, 15th; Savannah, 10th; Athens, 6th, 7th, 13th, 14th, 18th, 19th, 20th, 30th, 31st; Milledgeville, 12th.

Louisiana.—New Orleans, 9th to 12th; Point Pleasant, 4th, 5th, 6th, 9th.

North Carolina.—Charlotte, 13th; Smithville, 6th, 9th; Fort Macon, 9th to 14th.

South Carolina.—Stateburg, 9th to 15th; Charleston, 9th.

Texas.—Corsicana, 11th, 12th, 21st to 24th, 26th, 27th, 30th, 31st; Palestine, 8th, 9th; San Antonio, 8th to 11th; Indianola, 8th; Galveston, 7th to 11th; Brownsville, 8th, 9th; Rio Grande City, 10th; Fort Concho, 8th to 11th.

PRECIPITATION.

[Expressed in inches and hundredths.]

The distribution of rainfall over the United States and Canada for January, 1886, as determined from reports from more than seven hundred stations, is exhibited on chart iii.

In the following table are shown, for the several geographical districts, the normal January precipitation for a series of years; the average for January, 1886, and the excess or deficiency as compared with the normal:

Average precipitation for January.

Districts.	Average for January, Signal-Service observations.		Comparison of Jan., 1886, with the average for several years.
	For several years.	For 1886.	
	Inches.	Inches.	Inches.
New England.....	4.10	6.00	+1.90
Middle Atlantic States.....	3.99	3.81	-0.18
South Atlantic States.....	5.20	4.77	-0.43
Florida Peninsula.....	3.38	3.73	+0.35
Eastern Gulf States.....	6.10	6.80	+0.70
Western Gulf States.....	3.87	4.01	+0.14
Rio Grande Valley.....	1.70	1.44	-0.26
Tennessee.....	6.33	5.66	-0.67
Ohio Valley.....	3.52	3.81	+0.29
Lower lake region.....	2.69	3.15	+0.46
Upper lake region.....	2.14	3.44	+1.30
Extreme northwest.....	0.54	0.97	+0.43
Upper Mississippi Valley.....	1.82	2.81	+0.99
Missouri Valley.....	0.63	0.92	+0.29
Northern slope.....	0.99	0.94	-0.05
Middle slope.....	0.34	0.90	+0.56
Southern slope.....	0.90	0.33	-0.57
Southern plateau.....	0.69	2.27	+1.58
Middle plateau.....	1.24	1.31	+0.07
Northern plateau.....	2.63	3.43	+0.80
North Pacific coast region.....	7.13	8.80	+1.67
Middle Pacific coast region.....	4.04	6.21	+2.17
South Pacific coast region.....	1.22	4.42	+3.20

The precipitation for January, 1886, is in excess of the average on the Pacific coast, in the plateau districts, and generally in all northern districts east of the Rocky Mountains; over portions of Alabama, Mississippi, and Louisiana the precipitation is also above the average. The greatest excess occurs in California, where it averages from two to three inches. In New England, the upper lake region, northern plateau, and in the north Pacific coast, the excess averages more than one inch; in other districts where an excess is shown the values

are less marked. In Montana, the northern slope, Rio Grande Valley, Tennessee, and on the Atlantic coast from central New Jersey southward the precipitation is below the average for January, the deficiencies generally averaging below one-half inch.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows, for certain stations, as reported by voluntary observers, the average precipitation for the month of January for a series of years; the precipitation for January, 1886; and the departures from the average:

Station.	County.	Average precipitation for Jan.	Number of years.	Precipitation for January, 1886.	Departure.
		Inches.		Inches.	Inches.
<i>Arkansas.</i>					
Lead Hill.....	Boone.....	2.64	4	2.45	-0.19
<i>California.</i>					
Sacramento.....	Sacramento.....	4.23	12	6.26	+2.04
<i>Connecticut.</i>					
Hartford.....	Hartford.....	3.81	14	4.60	+0.79
Middletown.....	Middlesex.....	4.06	28	5.22	+1.16
New Haven.....	New Haven.....	4.18	14	3.53	-0.65
New London.....	New London.....	4.40	16	7.36	+2.96
Wallingford.....	New Haven.....	4.34	26	5.37	+1.03
<i>Dakota.</i>					
Webster.....	Day.....	1.69	3	1.24	-0.45
<i>Illinois.</i>					
Anna.....	Union.....	3.68	11	3.18	-0.50
Mattoon.....	Coles.....	2.63	6	2.80	+0.17
Riley.....	McHenry.....	1.82	24	3.60	+1.78
Swanwick.....	Perry.....	1.84	4	2.63	+0.79
<i>Indiana.</i>					
Lafayette.....	Tippecanoe.....	2.39	7	1.75	-0.64
Logansport.....	Cass.....	2.04	31	2.26	+0.22
Mauzy.....	Rush.....	3.18	6	4.27	+1.09
Spiceland.....	Henry.....	2.89	27	3.75	+0.86
Vevay.....	Switzerland.....	4.05	21	3.57	-0.48
<i>Iowa.</i>					
Cresco.....	Howard.....	0.96	10	3.72	+2.76
Monticello.....	Jones.....	1.75	32	3.35	+1.60
<i>Kansas.</i>					
Independence.....	Montgomery.....	1.59	14	1.58	-0.01
Wellington.....	Sumner.....	0.78	8	1.53	+0.75
Yates Centre.....	Woodson.....	0.99	6	1.64	+0.65
<i>Maine.</i>					
Eastport.....	Washington.....	3.59	13	9.01	+5.42
Gardiner.....	Kennebec.....	3.39	45	6.51	+3.12
Orono.....	Penobscot.....	3.69	18	6.64	+2.95
<i>Maryland.</i>					
Fallston.....	Harford.....	3.68	15	6.00	+2.32
<i>Massachusetts.</i>					
Amherst.....	Hampshire.....	3.28	51	4.55	+1.27
Cambridge.....	Middlesex.....	4.07	45	7.35	+3.28
Chestnut Hill.....	Middlesex.....	4.21	11	7.17	+2.96
Framingham.....	Middlesex.....	4.07	12	6.54	+2.47
Lake Cochituate.....	Middlesex.....	3.75	35	6.53	+2.78
Lowell.....	Middlesex.....	3.00	60	5.38	+2.38
Lynn.....	Essex.....	3.81	12	5.98	+2.17
Mystic Lake.....	Middlesex.....	4.04	11	6.23	+2.19
New Bedford.....	Bristol.....	3.85	73	6.77	+2.92
Somerset.....	Bristol.....	4.20	16	5.09	+0.89
Springfield.....	Hampden.....	3.48	39	5.31	+1.83
Waltham.....	Middlesex.....	3.00	61	7.12	+4.12
Williamstown.....	Berkshire.....	2.53	21	3.98	+1.45
Worcester.....	Worcester.....	3.90	45	6.52	+2.62
<i>New Brunswick.</i>					
Saint John.....	Saint John.....	4.11	36	8.94	+4.83
<i>New Hampshire.</i>					
Concord.....	Merrimac.....	3.08	31	4.92	+1.84
Hanover.....	Grafton.....	2.49	19	2.76	+0.27
<i>New York.</i>					
Plattsburg Barracks.....	Clinton.....	1.85	17	1.15	-0.70
Factoryville.....	Tioga.....	2.34	4	3.42	+1.08
Palermo.....	Oswego.....	3.14	23	3.90	+0.76
North Volney.....	Oswego.....	3.26	14	4.45	+1.19
<i>Ohio.</i>					
Wauseon.....	Fulton.....	2.15	12	2.78	+0.63
<i>Pennsylvania.</i>					
Dyberry.....	Wayne.....	2.93	17	2.85	-0.08
<i>Rhode Island.</i>					
Providence.....	Providence.....	3.94	55	7.10	+3.16
<i>South Carolina.</i>					
Kirkwood.....	Kershaw.....	3.40	21	2.61	-0.79
<i>Texas.</i>					
New Ulm.....	Austin.....	4.87	13	1.13	-3.74
<i>Vermont.</i>					
Linnbrook.....	Essex.....	3.01	38	2.65	-0.36
Newport.....	Orleans.....	3.15	11	3.48	+0.33
Stratford.....	Orange.....	3.02	11	4.40	+1.38
<i>Virginia.</i>					
Bird's Nest.....	Northampton.....	3.68	18	3.15	-0.53
Dale Enterprise.....	Rockingham.....	3.60	6	5.95	+2.35
Variety Mills.....	Nelson.....	4.18	7	3.82	-0.36
Wytheville.....	Wythe.....	3.55	21	3.88	+0.33
<i>West Virginia.</i>					
Helvetia.....	Randolph.....	5.63	10	3.45	-2.18

* From the "Bulletin of the New England Meteorological Society."

The following notes on the precipitation for January, 1886, are furnished by voluntary observers:

Illinois.—Riley, McHenry county: 25.2 of snow fell during the month, which is the largest amount ever recorded in January.

Mattoon, Coles county: the average snowfall for January, 9.0, is 2.9 above the average for the past six years.

Indiana.—Vevay, Switzerland county: the total snowfall, 6.7, is 2.6 below the January average for twenty-one years; the greatest January snowfall, 31.0, occurred in 1865, and the least, 1.1, in 1866.

Logansport, Cass county: the greatest January precipitation that has occurred in thirty-one years was 4.70, in 1870, and the least, 0.02, in 1872. The total snowfall for January, 17.3, is 4.9 above the average for thirty-one years; the greatest snowfall that has occurred in any January during this period was 35.4, in 1873, and the least, 0.2, in 1876.

Mauzy, Rush county: the total precipitation, 4.27, is the greatest that has occurred in any January in the past six years; the least was 1.63, in 1884.

Iowa.—Monticello, Jones county: the greatest precipitation that has occurred in January for the past thirty-two years was 3.77, in 1886, and the least, 0.29, in 1865; the greatest snowfall during this period was 28.5, in 1861; in January, 1857, no snow fell.

Cresco, Howard county: the total snowfall, 30.5, is 23.3 above the January average for the past ten years.

Maryland.—Fallston, Harford county: the greatest precipitation for January in the last fifteen years was 6.63, in 1882, and the least, 1.20, in 1872.

Massachusetts.—Worcester, Worcester county: the precipitation for January is far above the average; the total rainfall, including melted snow, was 6.52, against 5.01 during the same period last year, while the mean for the forty-six preceding years is but 3.90. The snowfall during the month was 23.5, against 12.1 during the same period in 1884, while the mean for a period of forty-seven years is 15.6.

New York.—Palermo, Oswego county: the total snowfall for January, 13.0, is 10.0 below the average for the past thirty-three years.

Ohio.—Wauseon, Fulton county: the largest precipitation that has occurred in any January for the past twelve years was 3.53, in 1880, and the smallest, 1.29, in 1879; the total snowfall, 13.0, is 1.5 above the average.

Pennsylvania.—Dyberry, Wayne county: the total snowfall for January, 15.0, is 0.5 below the average for twenty-seven years.

Texas.—New Ulm, Austin county: the maximum monthly rainfall that has occurred in any January for the past thirteen years was 10.56, in 1882, and the least, 1.13, in 1877 and 1886.

Virginia.—Variety Mills, Nelson county: 9.75 of snow fell during the month, which is 3.85 above the average for seven years.

In the tables of miscellaneous data are given the monthly precipitation, and the departures from the normal, at the various Signal Service stations. The following are some of the most marked departures from the normal:

Above normal.		Below normal.	
	Inches.		Inches.
Los Angeles, California.....	5.72	Cedar Keys, Florida.....	3.35
Eastport, Maine.....	5.70	Cape Henry, Virginia.....	1.97
Prescott, Arizona.....	5.01	Smithville, North Carolina.....	1.82
Sacramento, California.....	4.21	Charlotte, North Carolina.....	1.56
Escanaba, Michigan.....	3.52	Shreveport, Louisiana.....	1.41
Milwaukee, Wisconsin.....	3.12	Memphis, Tennessee.....	1.40
Alpena, Michigan.....	3.04	Chattanooga, Tennessee.....	1.23
Boston, Massachusetts.....	2.82	Fort Macon, North Carolina.....	1.19
Fort Apache, Arizona.....	2.72	Norfolk, Virginia.....	1.11

SNOW.

The dates on which snow fell in the various districts are as follows:

New England.—1st, 2d, 3d, 4th to 31st.

Middle Atlantic states.—5th to 19th, 21st to 25th, 27th, 30th, 31st.

South Atlantic states.—4th to 9th, 15th, 16th, 21st, 24th, 30th, 31st.

Florida Peninsula.—Fort Gatlin and Sanford, 12th.

East Gulf states.—Montgomery, Alabama, 9th; Birmingham, Alabama, 5th, 8th, 9th, 11th, 29th.

West Gulf states.—3d, 4th, 7th, 8th, 12th, 13th, 17th, 18th, 23d, 24th, 27th, 29th.

Rio Grande Valley.—Fort Ringgold, Texas, 11th, 12th; Rio Grande City and Fort McIntosh, Texas, 12th.

Tennessee.—4th, 5th, 6th, 8th, 9th, 18th, 19th, 23d, 24th, 25th, 27th, 29th, 30th, 31st.

Ohio Valley.—3d to 24th, 27th, 29th, 30th, 31st.

Lower lake region.—2d, 4th to 31st.

Upper lake region.—1st to 13th, 15th to 31st.

Extreme northwest.—1st, 4th to 7th, 11th, 14th, 15th, 16th, 18th to 21st, 23d to 31st.

Upper Mississippi valley.—1st to 9th, 12th to 31st.

Missouri Valley.—2d, 3d, 4th, 6th, 7th, 8th, 14th to 28th, 30th, 31st.

Northern slope.—1st, 2d, 3d, 5th to 11th, 13th to 27th, 30th, 31st.

Middle slope.—1st to 4th, 6th to 23d, 25th to 31st.

Southern slope.—7th, 11th to 14th, 16th, 27th.

Southern plateau.—1st to 7th, 9th, 11th to 23d, 26th.

Middle plateau.—1st, 4th to 7th, 12th to 27th, 30th, 31st.

Northern plateau.—1st, 4th, 5th, 6th, 12th to 26th, 31st.

North Pacific coast region.—12th to 27th.

Snow storms of unusual severity were reported, as follows:

Saint Paul, Minnesota: the snow storm of the 3d-4th caused numerous blockades on the railroads, greatly impeding traffic.

Kansas City, Jackson county, Missouri: a heavy snow storm occurred in western Kansas on the 3d and 4th, accompanied by strong winds which drifted the snow badly, causing the stoppage of trains. Reports from Colorado and New Mexico state that the storm was one of the most severe in several years.

Junction City, Davis county, Kansas: the worst snow storm that ever visited this section occurred on the 7-8th; railroad communication was cut off, and business almost suspended.

Clay Centre, Clay county, Kansas: the severest blizzard which has visited this section for several years occurred on the 8-9th; heavy snow fell, which drifted badly, causing interruption in traffic.

Marshalltown, Marshall county, Iowa: the storm of the 8th was the most severe that has been experienced in twenty-five years, the thermometer ranged from 27° to 32° below zero; all railroad trains were snowed in.

Mount Pleasant, Henry county, Iowa: a violent wind and snow storm occurred on the 7-8th; the snow drifted badly, which caused interruption in the running of trains.

Green Bay, Brown county, Wisconsin: a heavy storm, with blinding snow, occurred on the 8th, causing the suspension of business.

Cairo, Illinois: the heaviest snow storm on record occurred on the 8th; railroad travel was impeded, and traffic partially suspended.

Decatur, Macon county, Illinois: a snow storm of great violence occurred on the 8th; street-car tracks were snowed under, and railroad trains greatly delayed.

Galesburg, Knox county, Illinois: a heavy snow and wind storm occurred on the 8th; railroad trains were greatly delayed.

Highland, Madison county, Illinois: the worst snow storm that has visited this place for several years occurred on the 8th.

Duluth, Minnesota: a severe snow storm occurred on the 8-9th, accompanied by strong northwest wind; railroad trains were delayed.

Shawnee, Perry county, Ohio: the heaviest snow storm known for years occurred on the 8-9th; the Baltimore and Ohio Railroad was blockaded, and all the mines in the valley were idle for the want of cars.

Bowling Green, Warren county, Kentucky: the heaviest snow storm in five years occurred on the 8th.

Paducah, McCracken county, Kentucky: the heaviest snowfall for many years occurred on the 8th; trains in all directions were delayed.

Pittsburg, Pennsylvania: the snowfall of the 8th and 9th was the heaviest known for years; from twelve to fifteen inches covered the ground, which greatly interfered with street railway travel, and delayed trains in all directions.

Wilkesbarre, Luzerne county, Pennsylvania: a severe snow storm, accompanied by a heavy gale, occurred on the 9th; throughout Wyoming Valley snow fell to a depth of from thirteen to sixteen inches, causing great interference with all kinds of traffic.

Newburg, Orange county, New York: a furious snow storm occurred on the 8-9th, accompanied by high winds which, drifting the snow badly, delayed trains and rendered travel on the country roads very difficult.

Schenectady, Schenectady county, New York: a heavy snow storm occurred on the 9th which interfered with the running of trains.

Elmira, Chemung county, New York: the snow storm of the 9th was very severe in this part of the state; the heavy drifts blockaded the railroads; street cars were stopped, and business generally suspended.

Hudson, Columbia county, New York: the heaviest snow storm experienced for many years occurred on the 9th; travel in the country was almost suspended.

Baltimore, Maryland: the storm of the 9th was unusually severe, the high wind drifting the snow caused a general blockade of the railroads and a partial suspension of traffic.

Savannah, Georgia: a light fall of snow occurred on the 9th, the first in six years.

Staunton, Augusta county, Virginia: a heavy snow storm occurred on the 8-9th which blockaded railroads and rendered travel difficult.

Helvetia, Randolph county, West Virginia: the snow storm of the 9th was one of the heaviest ever observed here.

Bismarck, Dakota, 23d: it is reported that in many of the valleys the snow is over twenty feet deep; trappers and hunters who have been in the mountains for years state that they never saw as much snow before, and predict heavy floods in the spring.

Saint Paul, Minnesota: the storm of the 21st-22d was the worst known for years, the wind blew at a terrific rate and the drifting snow interfered with the running of trains, many of which were abandoned.

Mankato, Blue Earth county, Minnesota: a blizzard occurred on the 22d, the heavy wind filling the cuts with snow, blockading railroad trains; the temperature was below -20° throughout the day.

Austin, Mower county, Minnesota: the worst storm of the season occurred on the 22d, travel was entirely cut off by the drifting snow, and railroad trains were abandoned.

Oshkosh, Winnebago county, Wisconsin: a heavy wind, accompanied by snow, occurred on the 22d, causing great drifts which interfered with traffic; business was generally suspended.

Dubuque, Iowa: the heavy snow of the 21st and 22d caused a blockade of railroads worse than at any time this winter.

Elkhorn, Washington county, Illinois: the heavy snowfall of the 20th, 21st, and 22d made the highways almost impassable; all freight trains were abandoned.

LARGEST MONTHLY SNOWFALLS.

[Expressed in inches and tenths.]

Monthly snowfalls of ten inches or more were reported from the various states and territories during the month, as follows:

California.—Summit, 131; Cisco, 92; Emigrant Gap, 63; Truckee, 47; Boca, 43.5; Fort Bidwell, 26.5; Susanville, 18.5; Towles, 13.

Colorado.—Pike's Peak, 26.5; West Las Animas, 12.7.

Connecticut.—New London, 23; Hartford, 17; Norfolk, 16; Collinsville, 15.3; Middletown and Wallingford, 15; North Colebrook, 13.4; Southington, 12; New Haven, 11.1.

Dakota.—Richardton, 29.5; Deadwood, 17.5; Vermillion, 13.5; Fort Totten, 12.3.

Idaho.—Boisé City, 11.9.

Illinois.—Rockford, 40.5; Geneseo, 27; Chicago, 26.7; Bunker Hill, 26; Riley, 25.2; Windsor, 24.8; Bloomington, 23.8; Peoria, 17; Springfield, 12.5; Cairo, 12.

Indiana.—Logansport, 17.3; La Grange and Greenfield, 17; Princeton, 12; Degonia, 11.5; Buttrville, Fort Wayne, and Jacksonville, 11; Knightstown, 10.8; Farmland, 10.

Iowa.—Des Moines *a*, 37; Cresco, 30.5; Muscatine, 28.5; Independence, 25.8; West Union, 23.1; Fort Madison and Des Moines *b*, 22; Cedar Rapids, 20.8; Keokuk, 20.4; Manchester, 20; Dubuque, 18.5; Bancroft, 18; Oskaloosa *a*, 15.7; Davenport, 15; Oskaloosa *b*, 12.5; Monticello, 11.5.

Kansas.—Allison, 22; Wakefield, 20.5; Fort Scott and

Ninnescah, 20; Salina, 17; Concordia, 16.6; Atchison, 13.5; Topeka, 12; Wellington, 10.5.

Kentucky.—Penrod, 18.5; Richmond, 14; Frankfort, 12.9.

Maine.—Orono, 37; Cornish, 31; Bridgeton, 26; Mayfield, 25; Belfast and Gardiner, 24; Solon, 20.8; Portland, 18.2; Buckfield and Bar Harbor, 18; Kent's Hill, 16; Petit Manon, 11.

Maryland.—Fallston, 16.5; Baltimore, 13; Woodstock, 12; Cumberland, 10.

Massachusetts.—Beverly Farms, 36.5; Westvale, 29; Newburyport, 28.5; South Hingham, 27.5; Salem and Boston, 26; Lawrence, 23.8; Rowe and Worcester, 23.5; Williamstown *a*, 23; Williamstown *b*, 22; Concord, 21.2; Providence *a*, 20.8; Providence *b*, 20; Westborough, Cambridge, Olneyville, Gilbertville, and Hopkinton, 19; Lowell, 18.5; Fall River, 18; Taunton *a*, 17.5; Somerset and Northfield, 17.2; Framingham, 17; Taunton *b*, Woonsocket, Milton, and New Bedford, 16; Chestnut Hill, 15.8; Chicopee and Springfield, 15.5; Amherst and Fitchburg *b*, 15; Holyoke, 14.6; Leicester and Fitchburg *a*, 14; Ludlow, 12; Leominster, 10.5; Mendon, 10.

Michigan.—Traverse City and Alpena, 47; Escanaba, 40.4; Kalamazoo, 35.2; Manistique, 34.5; Mackinaw City, 29.8; Marquette, 28.3; Harrisville, 27.6; Pentwater, 22; Lansing, 20.5; Thornville, 20; Grand Haven, 19.7; Mottville, 19.5; Hudson, 12.5; Detroit, 12.2; Birmingham, 10.6.

Minnesota.—Winona, 56; Red Wing, 52.5; Spring Valley, 44; Northfield, 39; Dodge Center, 36; Minneapolis, 30.1; Albert Lea, 25; Duluth, 24.2; Saint Paul, 20.2; Wadena, 16; Saint Vincent, 12.3.

Missouri.—Pierce City, 18; Frankford, 13.8; Lamar, 11.8; Centreville, 10.4; Saint Louis, 10.

Montana.—Fort Maginnis, 20.8; Fort Assinaboine, 16.9; Helena, 10.9.

Nebraska.—Yutan, 28; Fremont, 23.7; De Soto, 23.4; Genoa, 21; Tecumseh and Stockham, 20; Omaha, 18.8; Crete, 16.8; Marquette, 15.7.

Nevada.—Otego, 13.5; Halleck, 12.5; Carson City, 11.7; Carlin, 11.

New Brunswick.—Parker's Ridge, 39; Saint John, 18.

New Hampshire.—Warner, 23.5; Littleton, 23.2; Hanover, 22.8; Nashua and Mount Washington, 22; Concord, 21; Manchester *a*, 20; Manchester *b*, 17.7; Walpole, 17.2.

New Jersey.—Sandy Hook, 18; Paterson, 16.5; Beverly, 14; Atlantic City, 13.5; Moorestown, 13; Princeton, 11; Vineland, 10.

New Mexico.—Galinas Springs, 10.5.

New York.—Ithaca, 27.7; Buffalo, 24.8; Albany, 19.7; New York City, 18.6; Humphrey, 18.5; Menand Station (near Albany), 17.2; Rochester, 16.7; Brooklyn, 16.5; Penn Yan, 16; Factoryville, 15.2; Mountainville, 14; Auburn, 13.4; Palermo, 13; Le Roy, 12.1; Setauket and White Plains, 10.

Ohio.—Garrettsville, 20.5; Hiram, 18; Cleveland, 17.8; Fostoria, 14.5; Jacksonborough, 14; Yellow Springs, 13.8; Wauseon, 13; McConnellsville, 11.5; College Hill, 10.5; Toledo, 10.3; North Lewisburg and Tiffin, 10.

Oregon.—Eola, 21.

Pennsylvania.—Troy, 23.5; Catawissa, 22.2; Erie, Pittsburg, and Grampian Hills, 22; Wilkesbarre, 21.2; Dillingersville, 19.5; Wysox, 16; Dyberry, 14.5; Wellsborough, 13.3; West Chester, 13; Germantown, 12.5; Quakertown, 11; Blooming Grove, 10.5; Fallsington, 10.2.

Rhode Island.—Pawtucket, 21.4; Lansdale, 18.5.

Tennessee.—Clements ville, 16.5; Riddleton, 10.7; Rogersville, 10.

Utah.—Ogden, 12.8; Salt Lake City, 10.5; Promontory, 10.2.

Vermont.—Strafford, 41; Jacksonville, 30; Brattleborough, 26.5; Chelsea, 24.6; Townshend and Windsor, 24.2; Dorset, 23; Marlborough, 21.4; Lunenburg, 19; Poultney, 18; Stowe, 16.5; Newport, 16.4; Vernon, 16; Charlotte, 13; Burlington, 11.

Virginia.—Dale Enterprise, 22.5; Wytheville, 19.2; Lynchburg, 15.8; Marion, 12; University of Virginia, 11.2.

Washington Territory.—Pleasant Grove, 27; Walla Walla,

25.2; Bainbridge Island, 19; Spokane Falls, 14; Port Angeles, 13.7; Tacoma, 13.

West Virginia.—Helvetia, 24.8; Parkersburg, 11.8.

Wisconsin.—Milwaukee, 51.2; Embarras, 40; Manitowoc, 33.5; La Crosse, 32.2; Wausau, 28; Neillsville, 27.1; Madison, 24.5; Prairie du Chien, 14.5.

DEPTH OF UNMELTED SNOW ON GROUND AT END OF MONTH.

[Expressed in inches and tenths.]

Arkansas.—Lead Hill, trace.

Colorado.—Pike's Peak, 0.5.

Connecticut.—Hartford and North Colebrook, 7; Southington, 4; Bethel and New Haven, 3; New London, 2.5.

Dakota.—Fort Totten, 12.4; Richardton, 10; Fort Buford, 6.4; Vermillion, 6; Webster, 5; Huron, 3; Deadwood, 2.3; Bismarek, 2.5; Yankton, 2.

Illinois.—Geneseo, 27; Riley and Rockford, 20; Bloomington, 16; South Evanston, 12; Peoria, 11; Chicago, 10; Bunker Hill, 8; Windsor, 7; Springfield, 5.2; Swanwick, 4; Charleston, 3.2; Mattoon, 3; Anna, 2.5; Collinsville, 2.

Indiana.—Logansport, 6.8; Guilford and Greencastle, 4; Vevay, Jeffersonville, Sunman, Spiceland, and Knightstown, 3; Indianapolis, 2.2; Fort Wayne and Lafayette, 2.

Iowa.—Cresco, 30; Muscatine, 22; West Union, 20; Des Moines, 17.9; Cedar Rapids, 16 to 18; Bancroft, 16; Manchester and Independence, 15; Fort Madison, 14; Oskaloosa, 11.5; Oskaloosa, 10.5; Monticello and Dubuque, 10; Keokuk, 8.5; Davenport, 0.1.

Kansas.—Wakefield, 15; Salina, 8; Allison, 6.5; West Leavenworth, 5.3; Manhattan, 4 to 6; Topeka, 3.4; Fort Scott, 3; Wellington, 2; Wyandotte, 1.5; Leavenworth, 1; Ottawa and Yates Centre, 0.8; Concordia, 0.5; Ninnescah, drifts; Dodge City, trace.

Kentucky.—Richmond, 3; Louisville and Frankfort, 1.4.

Maine.—Orono, 30; Gardiner, 18; Buckfield, 13; Eastport, 9; Bar Harbor, 8; Portland, 6.

Maryland.—Cumberland, 3; Woodstock, 1.5; Baltimore, 1; Fallston, drifts.

Massachusetts.—Worcester, 16; Milton and Blue Hill Observatory, 12; Leicester, 10; Williamstown and Boston, 9; Taunton and Deerfield, 8; Somerset, 5; Amherst, 4; Fall River, 3.

Michigan.—Traverse City, 30; Manistique, 25; Marquette, 22; Pentwater, 21; Escanaba, 19; Grand Haven, 17; Alpena, 16; Mackinaw City, 13; Detroit, 9; Hudson, 7; Birmingham and Port Huron, 4.

Minnesota.—Northfield, 30; Minneapolis, 24; Duluth, 18; Saint Paul, 14; Saint Vincent, 12.3; Moorhead, 2.

Missouri.—Frankford, 11.5; Centreville, 5; Pierce City, 4; Springfield, 2; Saint Louis, 1.8; Lamar, 0.1.

Montana.—Poplar River, 9; Fort Maginnis, 3; Fort Assinaboine, 2; Helena, 0.5.

Nebraska.—Yutan, 24; Stockham, 18; Tecumseh, 12; De Soto, Fremont, and Genoa, 10; Marquette and Harvard, 8; Omaha, 4; Hay Springs, 2.

New Hampshire.—Mount Washington, 22; Nashua, 11.

New Jersey.—Paterson and Sandy Hook, 4; Dover and Beverly, 2; Clayton, 1.5; Princeton, 1; Atlantic City, 0.5.

New York.—Palermo, 18; Oswego, 12; North Volney, 15 in the woods; Menand Station, 7.5; Auburn, 7; Mountainville, 6 to 7; Factoryville, Albany, and Humphrey, 6; White Plains, 5; Cooperstown, 4; Le Roy, Rochester, and Buffalo, 3; Senauket, 1; New York City, 0.5.

North Carolina.—Reidsville, 0.1.

Ohio.—Hiram, 7; Garrettsville, 6; Wauseon, College Hill, and Jacksonborough, 4; Cleveland, 1; Sandusky and Rugles, 3; West Milton, 2.5; Toledo, 2.2; North Lewisburg, Yellow Springs, Tiffin, Napoleon, Fostoria, McCounelsville, and Cleveland, 2; Cincinnati, 1.8; Westerville and Columbus, 1.

Oregon.—Albany, trace.

Pennsylvania.—Grampian Hills, 14; Dyberry, 8; Wellsborough, 6.1; Catawissa, Troy, Wysox, and Dillingersville,

6; Blooming Grove and West Chester, 4; Wilkesbarre, 3.5; Fallsington, Pittsburg, and Quakertown, 3; Erie, 2; Philadelphia, 1.

Rhode Island.—Block Island, 1.

Tennessee.—Austin, 3.

Vermont.—Strafford, 15; Brattleborough, 12.5; Post Mills, 12; Dorset and Poultney, 10; Stowe, 9.6; Newport, 8; Burlington, 5; Charlotte, 3 to 4.

Virginia.—Dale Enterprise, 4; Wytheville, 1 to 2; Variety Mills, drifts.

Washington Territory.—Spokane Falls, 1.

West Virginia.—Helvetia, 10; Parkersburg, 3.

Wisconsin.—Milwaukee, 38; Embarras, 34; Wausau, 26; La Crosse, 24; Madison, 16; Neillsville, 21; Prairie du Chien, 12.5; Manitowac, 3.

SNOW FROM A CLOUDLESS SKY.

Thornville, Lapeer county, Michigan: snow was observed to fall from a cloudless sky from 7 to 9 p. m. of the 11th.

Napoleon, Henry county, Ohio: at 10.30 p. m. of the 30th snow fell from a cloudless sky.

SNOW SLIDES.

Aspen, Pitkin county, Colorado: twenty-seven snow slides occurred from the 20th to 22d in the neighborhood of Maroon Pass. A party with eighteen mules who had gone to clear out the pass were overtaken by an avalanche and buried at the mouth of the cañon; six men were killed and the rest severely injured. The half way house, between this place and Crested Butte, occupied by a man named Larsen and his wife, was swept away on the 21st, together with several head of stock.

Salt Lake City, Utah: a snow slide at Thaynes Cañon, near Park City, caused the death of four men and their teams on the 28th.

HAIL.

Hail is reported to have fallen in the following states and territories:

Arkansas.—Mount Ida, 18th, 19th, 22d, 27th.

California.—Sacramento, Oakland, and San Francisco, 17th.

Idaho.—Boisé City, 24th.

Illinois.—South Evanston, 25th.

Indiana.—Lafayette, 16th.

Indian Territory.—Fort Reno, 15th.

Kansas.—Yates Centre, 26th; Wakefield, 21st.

Louisiana.—Morgan City, 3d; Grand Coteau, 22d.

Maine.—Buckfield, 22d, 28th; Gardiner and Cornish, 28th; Orono, 28th, 29th, 30th.

Massachusetts.—Dudley, 19th; Worcester, 19th, 24th, 25th.

New Jersey.—Moorestown, 9th.

New Mexico.—Lava, 1st.

New York.—Lowville, 16th.

North Carolina.—Reidsville, 16th; Charlotte, 21st; Weldon and Raleigh, 24th.

Oregon.—Astoria, 14th; Roseburg, 25th.

Pennsylvania.—Grampian Hills, 15th.

South Carolina.—Spartanburg, 21st.

Tennessee.—Nashville, 23d, 24th.

Texas.—Cleburne, 1st, 13th, 14th.

Utah.—Salt Lake City, 25th.

Vermont.—Brattleborough, 21st, 27th.

Virginia.—Dale Enterprise, 16th; Bird's Nest, 24th.

SLEET.

Sleet fell in the various states and territories, as follows:

Alabama.—20th.

Arizona.—14th.

Arkansas.—14th, 17th, 23d.

Connecticut.—9th, 16th, 19th, 26th.

Dakota.—24th, 25th.

District of Columbia.—8th, 18th, 25th, 30th.

Georgia.—8th, 15th.

Idaho.—25th.

Illinois.—15th, 20th.

Indiana.—4th, 15th, 20th, 22d, 27th, 28th, 29th.

Iowa.—1st, 2d, 3d, 14th, 26th.

Kansas.—2d, 14th, 20th, 26th.

Kentucky.—22d.

Louisiana.—8th.

Maine.—9th, 19th, 22d, 23d, 28th to 31st.

Maryland.—16th, 18th, 19th, 29th.

Massachusetts.—17th, 25th, 29th.

Michigan.—4th, 15th.

Minnesota.—14th.

Missouri.—3d, 14th, 15th, 18th, 27th.

Nebraska.—30th.

Nevada.—19th, 21st.

New Hampshire.—1st, 5th, 27th.

New York.—5th, 16th, 17th, 19th, 20th, 21st, 25th, 26th, 28th, 29th.

North Carolina.—8th, 10th, 24th, 25th, 26th.

Ohio.—15th, 18th, 20th, 21st, 22d, 27th, 28th.

Oregon.—22d.

Pennsylvania.—16th, 17th, 19th, 27th, 28th.

South Carolina.—15th, 16th, 24th.

Tennessee.—8th, 17th, 23d, 24th.

Texas.—3d, 11th to 14th, 17th, 19th.

Vermont.—21st, 28th.

Virginia.—8th, 16th, 18th, 24th, 25th, 26th.

Washington Territory.—10th, 13th, 14th, 23d, 31st.

Wisconsin.—3d, 4th, 25th.

The following reports indicate the severity of the sleet storm that prevailed in Massachusetts, New Hampshire, and Maine from the 27th to 29th:

Worcester, Worcester county, Massachusetts: the ice storm which began on the night of the 27th has had no equal during the past half century. The shade trees on many of the streets were locked together and looked like caves with brilliant stalactites, while the branches rustled and swayed like heavily beaded lace.

Princeton, Worcester county, Massachusetts: the most remarkable ice storm for the past thirty years occurred from the 28th to 31st; ice formed on trees and exposed surfaces from two to three inches thick; great damage was done to trees, telegraph wires, etc. The evergreen, spruce, and balsam trees were completely encased in ice, but were not broken as badly as the deciduous trees.

Portsmouth, Rockingham county, New Hampshire: the damage caused by the rain of the 28th was unparalleled in the history of this place; ice gathered in masses on trees and shrubbery of every description; hundreds of shade trees were completely ruined.

Portland, Maine: great damage was done to trees and telegraph lines throughout this section of the state during the rain of the 28-29th, which froze, covering everything with a thick coat of ice; several persons were seriously injured by the falling branches.

Gorham, Cumberland county, Maine: great damage was done to the beautiful elms for which this village is noted by the heavy coating of ice from the storm of the 28-29th.

Castine, Hancock county, Maine: the ice on trees was from one-half to two inches thick on the 28-29th; very few trees remained whole, and the streets and sidewalks in places were completely blocked by the falling limbs.

Saco, York county, Maine: a cold rain occurred on the 27-28th, which froze, covering everything with a thick coat of ice; the damage to timber and orchards throughout this country is estimated at several thousand dollars.

Bar Harbor, Hancock county, Maine: a very destructive ice storm occurred on the 28-29th, the rain, which froze as fast as it fell, coated everything exposed with ice, doing great damage to fruit and shade trees.

Richmond, Sagadahoc county, Maine: much damage was done to fruit and shade trees and telegraph lines in this vicinity by the ice storm of the 28-29th.

South Deer Isle, Hancock county, Maine: such a scene of destruction as occurred during the storm of the 28-29th has not been seen for years; the damage to fruit trees will amount to more than half their value.

Table of excessive and greatest monthly precipitation for January, 1886.

Station.	Specially heavy.		Largest monthly.	Station.	Specially heavy.		Largest monthly.
	Date.	Amt.			Date.	Amt.	
Alabama.				Alabama—Cont'd.			
Marion	2, 3	6.50	11.00	Valley Head	2, 3	3.88	7.31
Do	15	2.00		Mount Vernon	3	3.80	7.12
Greensborough	2, 3	6.77	10.15	Gadsden	1, 2	4.00	7.08
Mount View	2, 3	2.73	9.25	Birmingham	3	3.07	7.07
Do	8	2.50		Carrollton	15	2.20	6.95
Do	18	3.00		Centre	2, 3	4.38	6.79
Tuscaloosa	2, 3	5.00	8.84	Union Springs	3	2.75	6.72
Prattville	3	3.60	8.50	Montgomery	2, 3	2.41	6.69
Auburn	3	2.38	7.92	Mobile	3	2.15	6.12
Do	23	2.00		Newton	2, 3	2.50	
Eufaula	2, 3	4.06	7.46	Decatur	3	2.00	

Table of excessive and greatest monthly precipitation for January—Cont'd.

Station.	Specially heavy.		Largest monthly.	Station.	Specially heavy.		Largest monthly.
	Date.	Amt.			Date.	Amt.	
Arizona.				Massachusetts—C'd			
Prescott	19	3.90		Newburyport			7.76
British Columbia.				Cambridge			7.35
New Westminster.	23, 24	3.11	9.43	Chestnut Hill			7.17
California.				Boston	28, 29	2.05	7.08
Emigrant Gap			18.31	South Hingham			6.90
Cisco			14.55	Lowell			6.76
Summit			13.90	New Bedford			6.74
Colfax			12.17	Leicester			6.62
San Rafael	21, 22	3.00	11.08	Mystic Station			6.60
Do	24	2.05		Framingham			6.54
Murieta	16 to 19	7.46	10.66	Lake Cochituate			6.53
Redding			10.30	Worcester			6.52
Delta			9.95	Fitchburg			6.46
Towson			9.70	Concord			6.45
Fall Brook	18, 19	2.87	9.76	Cambridge			6.41
Calistoga			9.39	Long Plain			6.20
Hydesville	21, 22	3.90	8.73	Westvale			6.13
Dunnigan			8.37	Taunton			6.07
Boca			8.35	Lawrence			6.03
Suisun			8.15	Mississippi.			
Oakland			8.12	Vicksburg	1, 2	3.26	7.84
Napa			8.09	New Brunswick.			
Elmira			8.01	Parker's Ridge			10.60
Sacramento	19, 20	2.73	7.95	Saint John			8.49
Do	23	2.50		New Hampshire.			
Los Angeles	18, 19, 20	5.27	7.78	Bristol			6.61
Cahuenga Valley	18, 19, 20	5.85	7.05	Mt. Washington.	4, 5	2.17	
Aptos			7.61	New Jersey.			
Santa Cruz			7.60	Dover	3, 4, 5	3.15	
San Francisco	23	2.35	7.42	Paterson	4	2.14	
Angel Island	23	2.74	7.17	New York.			
Truckee			7.08	West Point			6.80
Alcatraz Island	23	2.60	7.10	Mountainville	3, 4, 5	3.14	
Presidio of S. F.	23	2.10	6.77	North Volney	4, 5	2.50	
San Fernando			6.70	White Plains	4, 5	2.40	
Galt			6.40	North Carolina.			
Poway			6.34	Hatteras			7.17
Sacramento			6.26	Lenoir	2, 3, 4	3.30	6.50
South Vallejo			6.25	Do	8	2.00	
San Mateo			6.20	Kitty Hawk	4, 5	2.41	6.21
Niles			6.17	Lincolnton	3, 4	3.65	6.19
Petaluma			6.09	Statesville	3, 4	3.67	
Gilroy			6.09	Charlotte	3, 4	2.57	
Fajary			6.05	Ohio.			
Benicia Barracks.	23, 24	2.52		Clyde			2.20
Connecticut.				Oregon.			
London	4, 5	2.31	7.39	Bandon	19 to 24	7.61	13.72
Collinsville			6.54	Do	30, 31	2.83	
Voluntown	29, 30	2.50	6.40	Astoria	22, 23	3.30	13.24
Norfolk			6.19	Albany			9.92
Bethel	5	2.40		Eola	22	2.21	9.42
Southington	4, 5	2.10		Portland	22, 23	2.12	9.33
Dist. of Columbia.				Roseburg			7.59
Distributing Res.	4, 5	3.07		Fort Klamath			7.30
Receiv'g Reser'r.	4, 5	2.53		Pennsylvania.			
Washington City.	4	2.28		Dillingersville			6.25
Florida.				Bloomington	4, 5	3.30	
Sanford	24, 25	2.76		Rhode Island.			
Georgia.				Olneyville			7.40
Forsyth	2, 3, 4	4.10	8.15	Providence			7.10
Atlanta	2, 3	3.76	7.33	Block Island	28	2.40	7.04
Milledgeville	4	2.48	7.31	Providence			6.41
Do	16	2.00		South Carolina.			
Athens			6.47	Spartanburg	2, 3, 4	3.90	8.70
Indiana.				Pacolet	2, 3, 4	3.77	6.95
Mauzy	15, 16	2.50		Tennessee.			
Degonia	15	2.10		Grief	2, 3	3.50	6.07
Louisiana.				Chattanooga	2, 3	3.66	6.78
Point Pleasant	1, 2	8.40	15.28	Hohenwald	2	2.62	6.71
Do	7, 8	5.00		Riddleton			6.64
New Orleans	15, 16	4.47	7.53	Dickson	2	2.50	6.19
Grand Coteau	22	2.00	7.31	Lexington	2, 3	2.25	6.17
Morgan City	3	2.00	6.80	Trenton			6.16
Do	15	4.00		Parkville	2, 3	3.57	6.15
Ashton Plantation	14, 15	4.10	6.71	Knoxville			6.12
Liberty Hill	14	2.10		Milan			6.04
Maine.				Manchester	2	2.02	
Bar Harbor	30, 31	3.60	9.29	Vermont.			
Eastport	28, 29	3.02	9.01	Brattleborough			6.47
Mayfield			8.06	Jacksonville			6.46
Kent's Hill			7.60	Marlborough			6.41
Kent's Hill			7.52	Townshend			6.00
Cornish			7.18	Stowe			6.00
Waterville			7.00	Virginia.			
Orono			6.64	Dale Enterprise	8, 9	5.49	13.68
Gardiner			6.61	Do	21	2.50	
Buckfield			6.48	Do	24, 25	2.10	
Bridgeton			6.13	Washington Ter.			
Maryland.				Tatoosh Island	19, 20	2.68	16.82
Fallston	4	2.60	6.00	Do	26, 27, 28	4.16	
Woodstock	3, 4	3.01		Pysht	22, 23	3.47	11.44
Fort McHenry	4	2.70		Olympia	23, 24, 25	4.00	9.47
Massachusetts.				Tacoma			7.91
Beverly Farms			9.30	Bainbridge Isl'd.	23	2.75	6.95
Taunton			7.79	Fort Canby			6.33

TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of water observed at the several stations; the monthly ranges of water temperature; the average depth at which the

observations were made; and the mean temperature of the air at the stations:

Temperature of water for January, 1886.

Station.	Temperature at bottom.		Range.	Average depth, feet and tenths.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey	40.0	28.5	11.5	6.6	29.7
Alpena, Michigan	52.5	30.7	1.8	12.5	15.3
Augusta, Georgia	53.3	32.6	20.5	14.6	40.2
Baltimore, Maryland	39.5	32.1	7.4	10.3	29.1
Boston, Massachusetts	38.1	29.5	8.6	19.6	25.9
Buffalo, New York	37.6	32.0	5.6	10.3	22.1
Canby, Fort, Washington Territory	49.8	38.3	11.5	15.5	40.1
Cedar Key, Florida	58.8	34.7	24.1	7.6	49.2
Charleston, South Carolina	51.6	28.5	23.1	39.1	42.8
Chicago, Illinois	37.3	33.1	4.2	9.0	21.4
Chincoteague, Virginia	41.8	28.4	13.4	2.7	32.7
Cleveland, Ohio	34.3	31.9	2.4	14.0	23.1
Detroit, Michigan	37.2	35.4	1.8	24.7	24.7
Duluth, Minnesota	34.5	33.1	1.4	10.3	5.7
Eastport, Maine	40.9	36.3	4.6	15.9	22.9
Escanaba, Michigan	50.6	31.0	29.6	12.2	47.3
Galveston, Texas	33.6	32.3	1.3	19.0	20.2
Grand Haven, Michigan	63.4	33.7	29.7	7.2	46.3
Indianola, Texas	57.6	42.0	15.6	18.0	50.7
Jacksonville, Florida	70.9	60.2	10.7	17.8	63.8
Key West, Florida	33.4	31.8	1.6	10.0	15.0
Mackinaw City, Michigan	56.2	35.0	21.2	11.1	39.7
Macon, Fort, North Carolina	34.4	32.2	2.2	12.6	13.8
Marquette, Michigan	52.6	40.5	12.1	15.9	44.1
Milwaukee, Wisconsin	41.0	30.6	10.4	15.6	25.4
Mobile, Alabama	38.8	32.4	6.4	12.2	27.8
New Haven, Connecticut	40.0	32.0	8.0	18.3	28.5
New London, Connecticut	44.6	31.2	13.4	15.9	34.3
New York City	55.4	39.8	15.6	16.6	40.3
Norfolk, Virginia	37.2	30.7	6.5	16.6	21.3
Pensacola, Florida	45.0	33.4	11.6	52.1	36.1
Portland, Maine	30.6	33.4	3.2	11.2	22.7
Portland, Oregon	41.0	30.9	10.1	2.2	38.8
Sandusky, Ohio	54.6	49.7	4.9	38.0	50.9
Sandy Hook, New Jersey	51.1	34.1	17.0	9.7	45.9
San Francisco, California	55.1	34.9	20.2	10.5	40.0
Savannah, Georgia	39.5	33.2	6.3	13.6	30.7
Smithville, North Carolina					
Toledo, Ohio					
Wilmington, North Carolina					

* Observations interrupted by ice; see text. † Observations interrupted from the 16th to the 31st.

Observations were interrupted by ice during the month, as follows:

Grand Haven, Michigan, 9th to 31st; Cleveland, Ohio, 9th to 31st; Sandusky, Ohio, 7th to 31st; Alpena, Michigan, 7th to 31st; Mackinaw City, Michigan, 6th to 31st; Marquette, Michigan, 8th to 31st; Duluth, Minnesota, 6th, 7th, 10th, 15th, 19th to 31st; Escanaba, Michigan, 1st to 31st; Detroit, Michigan, 7th to 31st; Chicago, Illinois, 7th to 31st; Milwaukee, Wisconsin, 1st to 31st; Chincoteague, Virginia, 12th to 17th; Toledo, Ohio, 8th to 31st.

WINDS.

The most frequent directions of the wind during January, 1886, are shown on chart ii by the arrows flying with the wind; they are also given in the tables of miscellaneous data. Over the eastern slope of the Rocky Mountains, in the extreme northwest, upper Mississippi and Missouri valleys, middle Atlantic and west Gulf states the prevailing winds were, in most cases, from the northwest; in the lower lake region and east Gulf states they were westerly; in New England and on the Pacific coast they were variable.

HIGH WINDS.

[In miles per hour.]

Wind-velocities of fifty or more miles per hour were recorded during the month, as follows:

Mount Washington, New Hampshire, 68, nw., 1st; 50, sw., 3d; 93, s., 4th; 72, sw., 5th; 52, s., 6th; 107, nw., 7th; 108, nw., 8th; 108 ne., 9th; 58, nw., 10th; 51, nw., 11th; 88, nw., 12th; 74, nw., 13th; 73, s., 16th; 73, nw., 17th; 96, nw., 18th; 80, se., 19th; 120, nw., 20th; 80, sw., 21st; 122, nw., 23d; 63, nw., 24th; 62, sw., 25th; 60, nw., 26th; 59, nw., 31st.

Pike's Peak, Colorado, 58, nw., 7th; 55, n., 8th; 74, nw., 9th; 80, nw., 10th; 63, nw., 11th; 50, sw., 21st; 88, w., 22d; 70, w., 23d; 70, w., 24th; 54, n., 28th; 64, nw., 29th; 70, nw., 30th.

Cape Mendocino, California, 68, se., 12th; 144, se., 20th; 72, se., 21st; 108, se., 22d; 86, se., 23d; 88, se., 26th.

Sandy Hook, New Jersey, 53, nw., 6th; 50, nw., 7th; 50, e., 8th; 66, ne., 9th; 53, nw., 23d.

Fort Elliott, Texas, 58, nw., 7th; 52, nw., 28th; 59, n., 22d.

Indianola, Texas, 53, n., 3d; 56, n., 7th; 60, n., 8th.

Fort Maginnis, Montana, 50, n., 14th; 62, sw., 9th.

Fort Macon, North Carolina, 53, sw., 8th; 62, sw., 9th.

Valentine, Nebraska, 54, nw., 6th; 66, nw., 7th.

Tatoosh Island, Washington Territory, 50, e., 18th; 54, e., 19th.

Fort Canby, Washington Territory, 60, se., 22d; 68, sw., 24th.

Atlantic City, New Jersey, 53, e., 8th; 52, e., 9th.

Eastport, Maine, 60, ne., 9th.

Sandusky, Ohio, 50, nw., 9th.

Rochester, New York, 60, w., 22d.

Red Bluff, California, 50, se., 20th.

Cheyenne, Wyoming, 52, nw., 21st.

Boston, Massachusetts, 64, ne., 9th.

Cape Henry, Virginia, 60, ne., 8th.

Block Island, Rhode Island, 64, ne., 9th.

LOCAL STORMS.

California.—San Francisco: an unusually severe storm occurred on the 20th, the wind reaching a velocity of forty-two miles per hour, blowing down trees, awnings, telegraph and telephone lines; in the western portion of the city several buildings were blown down, and a number of persons severely injured; in the business portion of the city signs, awnings, etc., were carried away and windows broken by the strong wind; the shipping in the harbor sustained but little damage, owing to the ample warning given.

Grass Valley, Nevada county: a heavy wind and rain storm occurred on the 20th; signs, fences, and telegraph lines were prostrated.

Half Moon Bay, San Mateo county: a heavy rain, and the severest wind storm within the past twenty-five years, occurred on the 20th; fences, buildings, and telegraph lines were blown down, and great damage done.

Chico, Butte county: the heaviest wind and rain storm for years occurred on the 20th, doing considerable damage to property.

Marysville, Yuba county: a terrific southeast gale and heavy rain storm occurred on the 20th, doing considerable damage about the city and in the surrounding country, hundreds of trees were uprooted, fences and telegraph lines blown down.

Rocklin, Placer county: the severe storm of the 20th blew down fences, trees, wind-mills, etc.

Sacramento: the heaviest wind storm in the past eight years occurred on the 20th; considerable damage was done in the city; fences, gates, small buildings, etc., were blown down, houses unroofed, trees and shrubbery destroyed or seriously injured.

Hydesville, Humboldt county: the heaviest wind storm for years occurred on the 20th; fences were scattered in every direction.

NAVIGATION.

STAGE OF WATER IN RIVERS.

The Mississippi River was frozen for the entire month at Saint Paul, Minnesota; from the 5th to 31st at La Crosse, Wisconsin; and from the 1st to 31st at Dubuque, Iowa. On the 28th a solid mass of ice blockaded the river from the mouth of the Illinois River as far south as Ste. Genevieve, Missouri, a distance of sixty-five miles; the ice was sixteen inches thick, and resembled in many respects the ice gorge which blockaded the river in 1875.

The Missouri River was frozen throughout the month at all stations, except at Leavenworth, Kansas, at which place it froze on the 4th.

The Arkansas River, at Fort Smith, was frozen from the 9th to 31st, and at Little Rock from the 9th to 26th.

The Ohio at Pittsburg reached its highest stage on the 6th, at which time it was within 0.8 inch of the danger-line.

In the following table are shown the danger-points at the various river stations; the highest and lowest depths for January, 1886, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, January, 1886.

[Expressed in feet and tenths]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, Louisiana.....	29.9	29	13.7	1	4.6	9.1
<i>Arkansas River:</i>						
Fort Smith, Arkansas.....	22.0	5	4.7	17	3.7	1.0
Little Rock, Arkansas.....	23.0	5, 6, 7	5.3	1	3.8	1.5
<i>Missouri River:</i>						
Yankton, Dakota.....	24.0					
Omaha, Nebraska.....	18.0					
Leavenworth, Kansas.....	20.0	2	7.0	2, 3	6.9	0.1
<i>Mississippi River:</i>						
Saint Paul, Minnesota.....	14.5					
La Crosse, Wisconsin.....	24.0	1	5.0	3	4.8	0.2
Dubuque, Iowa.....	16.0					
Davenport, Iowa.....	15.0	2, 16	7.1	3	5.2	1.9
Keokuk, Iowa.....	14.0	6, 9	8.7	15	3.0	5.7
Saint Louis, Missouri.....	33.0	31	13.3	12	8.4	8.9
Cairo, Illinois.....	40.0	11	30.2	2	18.0	12.2
Memphis, Tennessee.....	34.0	13, 14, 15	21.2	3, 4	11.8	9.4
Vicksburg, Mississippi.....	41.0	19	28.1	7	16.9	11.2
New Orleans, Louisiana.....	13.0	23	9.3	9	4.6	4.7
<i>Ohio River:</i>						
Pittsburg, Pennsylvania.....	28.0	6	21.2	14	4.5	16.7
Cincinnati, Ohio.....	50.0	9	34.9	3	14.2	24.7
Louisville, Kentucky.....	25.0	10	14.1	4	7.3	6.8
<i>Cumberland River:</i>						
Nashville, Tennessee.....	40.0	22	22.3	15	6.3	16.0
<i>Tennessee River:</i>						
Knoxville, Tennessee.....		6	11.8	12	1.5	10.3
Chattanooga, Tennessee.....	33.0	5	22.1	1	5.1	17.0
<i>Monongahela River:</i>						
Pittsburg, Pennsylvania.....	29.0	6	21.2	14	4.5	16.7
<i>Savannah River:</i>						
Augusta, Georgia.....	32.0	5	29.8	1	8.5	21.3
<i>Mobile River:</i>						
Mobile, Alabama.....		3	17.2	11	14.5	2.7
<i>Sacramento River:</i>						
Red Bluff, California.....		24	19.0	17, 18	2.8	16.2
Sacramento, California.....		28	25.6	18	17.1	8.5
<i>Willamette River:</i>						
Portland, Oregon.....		30	14.8	20	2.2	12.5
<i>Colorado River:</i>						
Yuma, Arizona.....		24	20.0	19	14.5	5.5

* Observations interrupted by ice; see text.

ICE IN RIVERS AND HARBORS.

Mississippi River.—Davenport, Iowa: floating ice in the river from 1st to 8th; river frozen, 9th to 13th, 17th to 31st.

Keokuk, Iowa: floating ice in the river, 1st, 2d, 3d, 6th to 21st; navigation was temporarily resumed on the 4th, when the steamer "White Eagle" arrived and departed for Saint Louis; the river was frozen from the 22d to 31st, the ice being fourteen inches thick at the close of the month.

Saint Louis, Missouri: floating ice in the river, 7th to 12th; an ice gorge formed on the 13th, the river remaining frozen from that date to the close of the month.

Cairo, Illinois: floating ice in the river, 8th, 9th, 12th, 14th; navigation between Cairo and Saint Louis was closed on the 9th, owing to the heavy floating ice; river frozen, 10th, 11th, 20th, 21st; an ice gorge formed on the 13th, and again on the 22d.

Memphis, Tennessee: floating ice, 8th to 15th, 23d to 27th.

Vicksburg, Mississippi: the heavy floating ice in the river on the 16th and 17th caused the suspension of navigation.

Missouri River.—Leavenworth, Kansas: ice formed along the shore of the river from the 4th to 7th; the river was completely frozen on the 8th, ice being sufficiently thick on the 9th for the passage of teams.

Arkansas River.—Fort Smith, Arkansas: river frozen from the 9th to 30th, but the ice was breaking up very rapidly on the evening of the 31st.

Ohio and Allegheny Rivers.—Pittsburg, Pennsylvania: floating ice in the rivers from the 8th to 31st. The Monongahela River was frozen from the 10th to 13th, causing the suspension of navigation.

Ohio River.—Cincinnati, Ohio: floating ice in river, 14th, 15th, 18th to 22d.

Cairo, Illinois: floating ice, 8th to 14th, 18th to 21st, 23d to 27th, 30th, 31st; the river was clear of ice on the 28th.

Louisville, Kentucky: heavy floating ice in the river from the 13th to 27th caused a partial suspension of navigation; river clear of ice, 28th to 31st.

Tennessee River.—Chattanooga, Tennessee: floating ice in river, 12th to 18th.

Knoxville, Tennessee: floating ice in the river, 10th to 14th, 17th, 18th, 22d to 31st.

Cumberland River.—Nashville, Tennessee: heavy ice-floes in the river caused the suspension of navigation on the 13th and 14th.

Duluth Bay.—Duluth, Minnesota: bay frozen, 9th to 31st; Lake Michigan remained free of ice up to the 6th, when ice formed which increased in extent until the 8th, when it was broken up by a heavy northwest wind; ice again formed from the 10th to 14th, but broke up on the 15th; ice rapidly formed on the 19th, the lake freezing as far as the eye could see, in which condition it remained until the close of the month.

Thunder Bay River.—Alpena, Michigan: river froze on the 7th.

Saint Clair River.—Port Huron, Michigan: large quantities of floating ice in the river, 5th, 7th, 8th; river frozen, 12th.

Grand River.—Grand Haven, Michigan: floating ice, 8th; river frozen, 9th.

Lake Michigan.—Chicago, Illinois: ice in the harbor, 7th; harbor frozen, 13th; on the 31st the lake was frozen as far as the eye could see.

Detroit River.—Detroit, Michigan: ice in river from the 7th to 31st.

Maumee River.—Toledo, Ohio: river froze on the 8th.

Sandusky Bay.—Sandusky, Ohio: bay frozen on the 7th.

Presque Isle Bay.—Erie, Pennsylvania: ice formed on the bay on the 7th, two inches thick.

Lake Erie.—Buffalo, New York: the lake froze as far as the eye could see on the 9th.

Niagara River.—Buffalo, New York: river froze on the 8th.

Oswego River.—Oswego, New York: river and harbor froze on the 12th.

Burlington Bay.—Burlington, Vermont: the bay froze on the 9th, closing navigation; Lake Champlain froze on the 24th.

Hudson River.—Albany, New York: floating ice in the river, 5th, 7th, 8th, 9th; an ice-dam formed near Coeyman's, Albany county on the 8th, causing a rapid rise in the water; river frozen on the 10th.

Newburg, Orange county, New York: the river was frozen over above and below this point on the 9th; ferry-boats were still running, but greatly impeded by heavy ice.

New York City: heavy ice in the river greatly interfered with navigation on the 10th and 11th.

Casco Bay.—Portland, Maine: ice formed in the harbor on the 8th.

Narragansett Bay.—Fall River, Massachusetts: on account of the heavy ice in the harbor on the 12th, no vessel could arrive or depart without the aid of steam.

New Haven Harbor.—New Haven, Connecticut: the harbor froze half way to its mouth on the 12th.

Delaware River.—Philadelphia, Pennsylvania: heavy ice was reported in sections of the river on the 12th; ice-boats were required to keep the channel open; the Gloucester ferry-boats were laid up for the winter on the 13th; numerous casualties were reported to shipping by the heavy ice in Delaware Bay.

Delaware Bay.—Cape Henlopen, Delaware: the harbor was entirely filled with ice on the 12th, 13th, and 14th, interfering with navigation and causing several casualties to shipping; large quantities of floating ice in the bay on the 17th.

Chesapeake Bay.—Baltimore, Maryland: navigation was partially suspended and rendered extremely hazardous from the 11th to 27th, on account of the heavy ice; vessels could only move with the assistance of ice-boats or powerful tugs; the s. s. "Raleigh" was sunk by ice near Seven Foot Knoll on the

19th, at which place the ice was unusually thick; great damage was done to shipping in all parts of the bay.

Salisbury, Wicomico county: the blockade of all the rivers by ice caused the entire suspension of the oyster business.

Havre de Grace, Harford county, Maryland: on the 13th the river bed was filled with large hummocks of ice and snow from ten to fifteen feet thick, and which, at many points, were jammed to the bottom, the river being completely closed.

Norfolk, Virginia: Elizabeth River, in the vicinity of this station, was frozen from the 12th to 19th, and navigation was suspended, except for the most powerful steamers.

James River.—Richmond, Virginia: the steamers "Old Dominion," for New York City, and "Ashland," for Philadelphia, left their wharves and were ice-bound about a mile below the city on the 12th. For several hundred rods from the "Old Dominion" wharf the ice was packed from six to ten feet on the 23d, and the screw dock of the James River Improvement Company was considerably damaged by gorging ice.

Chincoteague Bay.—Chincoteague, Virginia: the bay was frozen from the 10th to 17th.

Albemarle Sound.—Kitty Hawk, North Carolina: navigation was closed by ice from the 11th to 21st, a large number of steamers and sailing vessels being caught in the ice below Roanoke Island.

Savannah River.—Augusta, Georgia: floating ice, 11th to 14th; river partially frozen, 12th, 13th, 14th.

FLOODS.

California.—Brighton, Sacramento county: considerable damage was done by the high water in the American River on the 24th; several ranches were inundated.

Fresno, Fresno county: the levee that held back the water from the overflow of the dry arroyos which empty on the plains, broke at 2 a. m. of the 25th, submerging three-fourths of the town, and causing a loss of \$20,000.

Stockton, San Joaquin county: the San Joaquin River, which had been gradually rising for a week, overflowed a portion of the city on the 24th. Later, the Mass tract, comprising about three thousand acres of wheat, was flooded by the giving away of a flood-gate. The damage is estimated at about \$75,000. The water about Roberts' Island, which is protected by levees, rose nine feet above the level of the land. The pressure was too great for the levees to withstand, and a break occurred, through which the water rushed and soon converted thirteen thousand acres of wheat and orchards into a lake. The damage here is estimated at \$350,000.

Watsonville, Santa Cruz county: the Pajaro River overflowed its banks on the 25th, damaging the bridge of the Santa Cruz Railroad, and flooding the farms in the lower part of the valley.

Los Angeles: the heavy rain of the 18th and 19th caused a rise in the Los Angeles River, which overflowed its banks and submerged a vast area of the city and county; every railroad bridge on the river was more or less damaged, railroads were washed out in several places, telegraph lines prostrated, several hundred people made homeless, four lives lost, and hundreds of acres of vineyards and orchards destroyed.

The following is a summary of the destruction caused by this flood, as taken from the Los Angeles "Daily Herald":

About 1,000 feet of railroad track were wrecked, and every bridge on the river more or less demoralized; the river bank in many places was washed away, notably below the East Los Angeles bridge and on the Aliso tract; thousands of acres of vineyards and orchards washed or overflowed; many streets, notably Centre, Vignes, Turner, Banning, First, and Alameda were torn to ruin by deep and dangerous floods; possibly half a hundred houses were wrecked beyond recognition, and several hundred were soaked with water; a large portion of the city was rendered unhealthy for the coming summer by reason of the soil being soaked with water; miles of fences went down the stream; hundreds of lots before considered valuable, were washed to the sea; traffic and trade was stopped and freight delayed; tourists were storm-bound, and people away from home were unable to return; four or more lives were lost, and property to the amount of half a million dollars destroyed.

Connecticut.—Hartford, Hartford county: the Connecticut River rose rapidly on the 3d, and on the 4th reached a height of 18.5 feet above low-water mark, submerging the docks.

New Haven, Connecticut: the Connecticut River at Hartford, on the 7th, rose to 18.5 feet above low-water mark, and was the highest point of the freshet that began on the 4th; the high water submerged the docks at this place.

Georgia.—Augusta: the heavy rain of the 3d-4th caused a rapid rise in the Savannah River, which reached a height of 30.2 feet on the 5th, or within 1.8 feet of the danger-line; several of the streets in the western portion of the city were submerged; mills in the flooded portion were compelled to suspend work.

Maryland.—Baltimore: owing to the heavy rain and high water in the harbor on the 4th several streets were flooded, causing damage to the amount of \$2,000.

Port Deposit, Cecil county: the Susquehanna River was three feet above high-water mark on the 5th; many lumber yards were submerged, and large quantities of logs floated down the river.

Salisbury, Wicomico county: a heavy rain, accompanied by a northeast gale, backed the waters of the Wicomico River up on the 8th and 9th, which flooded the entire business portion of the town, causing the suspension of business. The river was several inches higher than at any previous time; piers and bridges were washed away and considerable lumber lost.

New York.—Albany: a rapid rise in the river on the 5th, 6th, and 7th submerged the docks and caused considerable damage to the merchants along Quay street.

Mountainville, Orange county: the "Awessima" rose to a dangerous height on the 5th, and was higher than at any time since September, 1882; meadows and roads were badly washed.

Elmira, Chemung county: the Chemung River rose over ten feet on the 5th, flooding basements and cellars in the business streets. At Owego, the Erie railroad bridge was carried away and the Tioga branch of the Erie Railway was abandoned. Considerable damage was done on the Northern Central Railway, a bridge having been carried away at Trout Run.

Rondout, Ulster county: the snow on the Catskill Mountains, together with the heavy rain of the 5th, caused a flood in Esopus Creek, imprisoning a number of families on the flats in Kingston; one man was drowned.

Lowville, Lewis county: the water in Black River and the streams tributary thereto was higher on the 7th than for a number of years, rendering travel by road between this place and the towns on the east side of the river impossible; no serious damage was done in this vicinity, but great damage was done in other parts of the county.

Ithaca, Tomkins county: Fall Creek, flowing through the northern part of this city, was gorged with ice on the 10th, flooding a large portion of the surrounding territory to the depth of several feet, filling cellars and doing considerable damage.

Oswego: ice gorge formed at the mouth of the Oswego River on the 9th, which caused a rapid rise in the river during the night, overflowing docks and filling the adjoining cellars, causing great damage to goods stored therein.

Fulton, Oswego county: an ice gorge in the Oswego River on the 9th caused the most destructive flood that has ever visited this place during the 10th, 11th, and 12th; at least seventy-five families were rendered homeless; several buildings and a great amount of property were swept away; business was entirely suspended and 1,500 employes of the mills and factories remained idle.

Pennsylvania.—Emporium, Cameron county: the heavy rain of the 3d and 4th, together with the large quantity of snow on the timbered hills, produced the most violent flood known for many years in the Sinnemahong and Driftwood Creeks; thousands of logs from the mills broke from their fastenings and went down the swollen streams with terrific speed; it is estimated that the loss at Emporium will approach \$3,000,000. At Bradford there was two feet of water in many of the streets, and at Cameron the greater portion of the town was under water.

Shenandoah, Schuylkill county: the rain storm throughout this section on the 4th was the most severe for a number of years; no less than twelve collieries in Mason Valley were flooded; railroad trains were delayed and great damage done. Three washouts occurred between Delano and Ashland on the Lehigh Valley Railway.

Lock Haven, Clinton county: the flood on the Susquehanna River reached its height on the 5th and submerged three-fourths of the city; no lives were lost, but the damage was very great.

Lock Haven, Clinton county: the greater part of the city was flooded on the 5th, the water in the Susquehanna River being within two feet as high as it was in the great flood of 1865; large quantities of saw-logs broke loose and were lost.

Williamsport, Lycoming county: great damage was done by the high water in the Susquehanna River on the 5th; the track of the Philadelphia and Reading Railroad was covered, preventing the running of trains. All streams were high, and heavy land slides have occurred near Montgomery and other points east of this city; bridges were washed away, and travel on public roads wholly interrupted; over a million feet of valuable lumber was washed away.

Easton, Northampton county: on the afternoon of the 5th the Lehigh River was sixteen feet high and in the Delaware River eighteen feet; several mills and factories were inundated, causing the suspension of business; railroad trains were delayed by washouts and land slides.

Mauch Chunk, Carbon county: the Lehigh River was higher on the 5th than at any time since the disastrous freshet of 1862; cellars were flooded and great damage done.

HIGH TIDES.

Salisbury, Wicomico county, Maryland: an unusually high tide occurred on the 8th; the water rose three feet above high-water mark, submerging portions of the city and sweeping away large quantities of lumber.

Westover, Somerset county, Maryland: a very high tide occurred on the 9th, which caused a heavy destruction of property in the lower part of Fairmount district; the water covered a number of farms to the depth of several feet.

New Bedford, Bristol county, Massachusetts: the heaviest tide for several years occurred on the 9th; wharves were overflowed, and Fish Island was completely covered.

High tides also occurred, as follows:

Eastport, Maine, 21st, 22d, 23d.

Newport, Rhode Island, 9th.

New London, Connecticut, 9th.

Sandy Hook, New Jersey, 9th.

Cedar Keys, Florida, 8th.

San Francisco, California, 20th.

Bird's Nest, Virginia, 9th.

LOW TIDES.

Indianola, Texas, 8th to 11th.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for districts east of the Rocky Mountains for January 1886, with the telegraphic reports for the succeeding thirty-two hours, shows the general average percentage of verifications to be 80.78 per cent. The percentages for the four elements are: Weather, 82.81; direction of the wind, 83.41; temperature, 77.41; barometer, 78.14 per cent. By geographical districts, they are: For New England, 85.95; middle Atlantic states, 86.80; south Atlantic states, 84.37; eastern Gulf states, 86.44; western Gulf states, 80.91; lower lake region, 78.84; upper lake region, 79.41; Ohio Valley and Tennessee, 81.04; upper Mississippi valley, 72.41; Missouri Valley, 71.11. There were eleven omissions to predict, out of 3,252, or 0.31 per cent. Of the 3,241 predictions that have been made, one hundred and twenty-eight, or 3.95 per cent., are considered to have entirely failed; one hundred and sixty-one,

or 4.97 per cent., were one-fourth verified; four hundred and fifty-seven, or 14.10 per cent., were one-half verified; five hundred and eighty-three, or 17.99 per cent., were three-fourths verified; 1,912, or 58.99 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

The percentages of verifications of special predictions for certain localities are, as follows:

Baltimore, Maryland (twenty-seven days), 80.09; Washington City (twenty-seven days), 77.32; Erie, Pennsylvania, 75.81; Boston, Massachusetts, and New Haven, Connecticut, 86.47; Portland, Maine (thirty days), 77.50; Albany, New York, 74.60; Pittsburg, Pennsylvania, 80.24; Cincinnati, Ohio, 76.61; Louisville, Kentucky, 76.61; Sandusky, Ohio (thirty days), 75.83; Cairo, Illinois, 76.23; Saint Louis, Missouri, 69.35; Kansas, Indian Territory, and western Missouri, 66.94; Memphis, Tennessee, 73.39; Shreveport, Louisiana, 75.81; Iowa, 67.74; Tennessee, 79.10; northern Florida, 77.82; Lynchburg, Virginia (twenty-seven days), 65.74; Columbus, Ohio (twenty-six days), 70.19; Cleveland, Ohio (twenty-nine days), 78.45; Indianapolis, Indiana, 75.40; Oswego, New York, 76.61; Rochester, New York, 77.42; Buffalo, New York, 76.61; Milwaukee, Wisconsin, 76.61; Chicago, Illinois, 72.58; Detroit, Michigan, 70.96; Toledo, Ohio, 70.96; Omaha, Nebraska (twenty-six days), 74.04; Arkansas (twenty-six days), 87.99; Georgia (twenty-four days), 88.02; Saint Paul, Minnesota (twenty-three days), 65.22; Augusta, Atlanta, and Savannah, Georgia (three days), 70.83; New York City, 88.71; Philadelphia, Pennsylvania, 84.68; Colorado (thirty days), 77.08.

CAUTIONARY SIGNALS.

During January, 1886, one hundred and thirty-six cautionary signals were ordered. Of these, one hundred and fourteen, or 83.82 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. Fifty-four cautionary off-shore signals were ordered, of which number, forty-one, or 75.93 per cent., were fully justified, both as to direction and velocity; fifty-three, or 98.15 per cent., were justified as to direction; and forty-one, or 75.93 per cent., were justified as to velocity. One hundred and ninety signals of all kinds were ordered, one hundred and fifty-five, or 81.58 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Of the above cautionary off-shore signals, forty-eight were changed from cautionary. Five signals were ordered late. In twenty-five cases, winds of twenty-five miles or more per hour were reported for which no signals were ordered.

COLD-WAVE SIGNALS.

During January, 1886, three hundred and twenty-six cold-wave signals were ordered, of which number, two hundred and sixty-eight, or 82.21 per cent., were justified.

RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the "Alabama Weather Service," in the report for January, 1886, states:

The verifications of predictions for the whole area was 94 per cent. for temperature, and 94 per cent. for weather.

The following roads comprise this system: Western of Alabama; South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia system in Alabama; Memphis and Charleston; Columbus Western; Alabama Great Southern; Atlanta and West Point of Georgia; Northeastern of Georgia; Atlanta and Charlotte Air Line; Western and Atlantic; Georgia; East Tennessee, Virginia and Georgia system in Georgia; and Montgomery and Eufaula.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays occurred during January, as follows:

Saint Vincent, Minnesota: an aurora was observed at 9.20 p. m. of the 1st, extending from 125° to 200° azimuth, consisting of an irregular whitish light of about 15° altitude from which occasional streamers shot up to an altitude of 30°; the display lasted until after midnight.

Table of miscellaneous meteorological data for January, 1886—Signal Service observations.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths).					Temperature of the air (in degrees Fahrenheit).										Winds.												
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.		Monthly mean.	Departure from normal.	Extremes.		Monthly range.	Daily ranges.			Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal.	Total movement.	Prevailing direction.	Maximum velocity.		No. of rainy days.	No. of cloudy days.	No. of fair days.				
					Highest barometer.	Lowest barometer.			Max.	Min.		Mean min.	Mean max.	Greatest.							Least.	Miles p. h.				Direction.	Date.		
					Date.	Date.			Date.	Date.		Date.	Date.	Date.							Date.	Date.				Date.	Date.		
New England.																													
Eastport	61	29.93	-.03	30.00	30.82	28.89	91.93	22.9	46.1	30.5	15.0	61.0	36.2	23	3.5	22	79.5	17.3	9.01	5.70	8,700	n.	60	ne.	9 20 15	6			
Portland	99	29.90	-.05	30.01	30.83	28.81	92.02	21.3	47.8	28.2	14.8	60.2	33.1	23	3.9	30	81.6	16.4	4.05	1.35	6,188	n.	40	ne.	9 17 12	6			
Mount Washington	6,279	23.43	.....	30.06	30.72	28.05	91.67	11.4	37.5	29.3	3.7	17.4	15.8	23	3.7	28	62.0	10.5	4.85	0.61	23,889	n.	122	n.	23 20 6	10		
Boston	125	29.88	-.08	30.02	30.72	28.73	92.09	25.9	53.6	32.7	18.7	63.7	30.6	23	3.8	37.8	18.4	7.08	2.82	9,323	w.	64	ne.	9 18 11	9				
Block Island	27	29.98	.....	30.00	30.77	28.81	91.96	30.2	52.1	35.4	24.6	61.2	22.6	23	2.1	22	62.0	25.4	7.04	1.76	14,124	n.	64	ne.	9 19 12	6		
Narragansett Pier	107	29.91	.....	30.02	30.82	28.86	91.96	25.4	52.4	33.2	17.1	59.3	29.9	15	4.7	27	78.5	19.4	5.53	0.69	7,809	n.	44	ne.	9 15 11	7		
New Haven	47	29.99	.....	30.03	30.83	28.80	92.03	27.8	49.9	34.2	20.3	63.2	27.0	15	4.0	37.7	21.5	7.39	3.18	5,655	n.	40	ne.	9 17 9	5			
Mid. Atlantic States.																													
Albany	83	29.99	-.07	30.08	30.90	28.94	91.96	20.4	56.9	38.5	13.3	66.7	31.1	6	6.7	28	78.7	14.8	3.66	0.89	5,417	n.	36	ne.	4 13 10	5			
New York City	164	29.86	-.11	30.04	30.84	28.80	92.03	28.5	53.9	35.7	22.2	50.9	24.2	6	4.5	27	78.2	22.5	5.02	1.35	9,317	n.	44	ne.	9 12 10	9			
Philadelphia	117	29.92	-.11	30.04	30.86	28.69	92.16	29.4	58.1	35.9	23.0	54.2	22.6	23	3.8	27	73.8	21.8	3.69	0.21	9,000	n.	40	ne.	9 13 11	8			
Atlantic City	13	30.02	-.12	30.02	30.78	28.77	92.01	29.7	52.8	37.7	21.9	50.7	25.2	8	6.4	28	83.0	25.1	3.17	0.83	8,123	n.	53	e.	8 14 7	6			
Barnegat City	22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Little Egg Harbor	27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sandy Hook	28	30.02	-.11	30.04	30.83	28.80	92.04	28.8	52.1	34.2	23.3	48.0	21.4	23	3.5	29	78.2	22.8	4.47	0.15	14,649	n.	66	ne.	9 14 7	10			
Cape Henlopen	32	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Baltimore	45	30.03	-.11	30.07	30.86	28.90	91.86	29.1	56.7	36.0	22.6	49.4	22.2	15	2.9	27	74.3	21.7	4.48	1.31	4,789	n.	27	se.	4 16 11	6			
Ocean City	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington City	106	29.97	-.10	30.07	30.85	28.96	91.89	28.9	59.9	36.4	22.4	61.1	29.0	14	4.0	27	81.5	23.7	5.01	1.60	4,708	n.	28	e.	4 15 9	7			
Cape Henry	16	30.04	-.11	30.04	30.78	28.91	91.78	34.5	61.0	41.6	10.7	10.7	33.7	2	3.4	17	80.6	28.9	2.99	1.97	10,435	n.	60	ne.	8 9 5	20			
Chincoteague	8	30.04	-.11	30.03	30.79	28.96	91.84	32.7	54.9	39.8	7.3	12	26.7	47.6	31.9	9	2.8	27	77.8	26.3	4.03	0.91	11,228	n.	42	w.	9 15 6	18	
Lynchburg	652	29.35	-.11	30.05	30.80	28.92	91.58	31.3	55.0	40.2	23.3	67.7	32.0	14	4.7	27	77.0	24.6	4.56	0.31	3,182	n.	17	se.	4 15 12	4			
Norfolk	30	30.02	-.14	30.02	30.73	28.93	91.70	34.3	63.2	42.1	28.6	53.8	35.8	9	4.0	28	79.9	28.4	2.93	1.11	5,176	n.	38	w.	9 15 7	10			
South Atlantic States.																													
Charlotte	808	29.20	-.10	30.06	30.76	28.94	91.42	35.3	63.0	44.1	27.0	63.6	25.5	4	6.8	16	71.7	26.4	4.94	1.56	4,642	ne.	27	e.	8 13 10	9			
Fort Macon	11	30.04	-.13	30.02	30.68	28.91	91.44	39.7	63.4	40.5	34.0	53.4	31.6	9	7.0	24	85.7	35.7	4.86	1.19	12,599	n.	62	sw.	9 14 9	12			
Hatteras	12	30.03	-.13	30.02	30.69	28.91	91.52	39.8	63.3	46.3	34.7	49.0	30.9	9	4.0	25	84.5	35.3	7.17	0.54	10,913	n.	46	w.	9 14 8	10			
Kitty Hawk	9	30.04	-.14	30.03	30.75	28.96	91.69	37.4	61.9	43.5	31.8	51.4	30.7	9	4.5	25	81.1	31.9	6.23	0.17	11,943	n.	48	e.	8 16 9	7			
New River Inlet	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Smithville	34	30.01	-.14	30.02	30.72	28.92	91.44	40.0	63.0	47.1	7.8	12	32.6	55.2	26.4	15	7.1	3	78.0	33.5	2.14	1.52	6,669	ne.	44	w.	9 11 12	7	
Charleston	52	30.02	-.12	30.04	30.77	28.93	91.28	42.8	66.7	50.7	10.5	11	35.0	59.8	24.1	26	77.1	35.5	5.64	1.52	5,975	w.	29	w.	9 12 3	19			
Augusta	183	29.90	-.12	30.06	30.71	28.93	91.34	40.2	71.1	51.0	6.0	12	37.8	58.0	25.0	18	6.0	28	77.8	38.8	2.92	0.72	6,660	w.	32	w.	8 9 18	10	
Savannah	87	29.99	-.11	30.05	30.65	28.94	91.24	45.9	70.0	54.5	12.0	12	37.8	58.0	25.0	18	6.0	28	77.8	38.8	2.92	0.72	6,660	w.	32	w.	8 9 18	10	
Jacksonville	43	30.03	-.11	30.04	30.53	28.99	91.04	50.7	72.9	59.4	15.3	12	43.2	57.6	26.6	18	5.4	28	76.8	43.7	2.81	0.85	5,865	w.	37	sw.	8 10 15	11	
Florida Peninsula.																													
Cedar Keys	22	30.03	-.12	30.01	30.46	28.98	90.88	49.2	73.0	57.2	15.5	10	42.9	57.5	29.6	14	7.6	3	86.9	45.4	1.86	3.35	6,892	w.	32	w.	8 10 11	7	
Key West	20	30.05	-.06	30.02	30.33	28.95	90.58	63.8	6.5	79.2	59.6	38.4	15.5	8	3.9	10	83.0	58.3	1.45	1.01	8,639	ne.	30	n.	25 8 10	18			
Sanford	25	30.06	.....	30.05	30.46	28.96	90.80	53.1	5.8	77.0	45.2	56.0	28.8	18	5.7	27	76.6	45.3	4.77	2.97	5,118	w.	26	w.	9 11 11	7		
Eastern Gulf States.																													
Atlanta	1,139	28.87	-.12	30.07	30.63	28.94	91.16	36.1	74.9	59.3	28.2	62.3	29.0	22	6.8	29	74.1	28.1	7.33	0.01	8,857	n.	36	se.	8 13 13	9			
Pensacola	30	30.05	-.11	30.04	30.57	28.94	91.02	46.3	67.1	53.3	14.9	9	30.9	52.2	35.0	8	5.8	20	76.4	38.8	5.30	0.29	5,812	n.	28	w.	4 14 7	7	
Mobile	35	30.06	-.09	30.06	30.60	28.95	91.02	44.1	63.3	51.7	11.0	9	35.7	57.3	38.8	8	8.3	26	79.4	37.4	6.12	0.71	6,820	n.	32	se.	3 13 12	6	
Montgomery	219	29.86	-.09	30.07	30.56	28.90	91.12	41.8	66.3	50.5	5.4	9	33.6	60.3	31.4	8	5.3	26	75.4	34.3	6.69	1.71	5,447	w.	30	w.	8 11 13	6	
Vicksburg	209	29.90	-.07	30.10	30.65	28.98	90.96	38.0	66.2	46.9	3.1	9	30.4	59.2	39.3	8	4.9	24	78.7	31.6	7.84	2.19	3,805	n.	27	w.	4 11 13	6	
New Orleans	52	30.04	-.06	30.06	30.57	28.97	90.90	45.5	68.5	53.0	15.3	9	38.7	56.6	35.8	8	6.5	25	79.8	39.0	7.53	1.81	6,205	n.	31	e.	15 9 7	7	
Western Gulf States.																													
Shreveport	227	29.88	-.06	30.10	30.62	28.92	91.03	38.1	75.0	69.2	48.1	1.3	8	29.1	68.6	35.4	7	6.0	16	67.8	28.4	3.87	1.41	n.	10 11 10	10
Fort Smith	470	29.62	-.09	30.12	30.72	28.92	91.11	37.1	55.0	42.0	35.5	6.9	8	19.8	70.9	29.9	7	4.3	14	75.1	20.0	2.52	0.50	5,497	e.	25	n.	4 9 16	10
Little Rock	299	29.78	-.07	30.07	30.7	28.92	91.05	39.1	72.5	61.0	26.3	65.8	35.6	20	3.1	15	82.3	24.4	3.97	0.73	4,630	n.	25	n.	22 13 14	6			
Galveston	40	30.0	-.02	30.09	30.64	28.96	91.04	47.3	52.8	37.4	54.9	11.0	8	39.8	57.7	35.0	7	5.4	25.7	43.0	3.45	0.66	9,052	e.	42	n.	7 10 8	14	
Indianola	26	30.08	-.05	30.07	30.67	28.93	91.04	40.3	61.1	33.2	54.4	11.6	8	38.3	61.7	40.9	7	4.8	11	83.3	31.0	2.51	0.21	12,203	n.	60	n.	8 9 8	11
Palestine	533	29.57	-.08	30.12	30.64	28.97	90.97	39.3	71.5	56.0	0.0	8	29.8	75.1	44.0	7	6.2	16	73.8	30.7	3.65	0.97	7,944	n.	40	n.	26 11 8	9	
San Antonio	78																												

Table of miscellaneous meteorological data for January, 1886—Signal Service observations—Continued.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths).					Temperature of the air (in degrees Fahrenheit).										Winds.																
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.		Monthly mean.	Departure from normal.	Extremes.		Monthly range.	Daily ranges.			Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal.	Total movement.	Prevailing direction.	Maximum velocity.		No. of rainy days.	No. of cloudy days.	No. of fair days.								
					Highest barometer.	Lowest barometer.			Max.	Min.		Greatest.	Least.	Miles p.hr.							Direction.												
					Date.	Date.			Date.	Date.		Date.	Date.	Date.							Date.												
Upper Miss. Valley.																																	
Saint Paul.	831	29.20	+0.04	30.17	30.57	11 29.68	4.0.89	4.1	8.9	30.0	1	12.3	33.9	23	4.8	63.9	34.3	22	7.6	385.0	0.3	1.76	+0.78	4.633	nw.	24	nw.	4	18	9	18	14	
La Crosse.	725	29.29	0.00	30.11	30.57	23 29.49	4.1.08	12.6	3.0	36.7	15	20.3	25.6	10	5.0	62.3	34.2	23	3.7	175.5	6.2	3.44	+2.30	5.519	n.	24	n.	3	12	14	6	3	
Davenport.	615	29.41	-0.05	30.11	30.59	23 29.40	3.1.13	13.3	8.1	49.5	3	21.0	21.4	10	0.3	70.9	30.1	16	4.1	157.2	7.8	2.22	+0.52	6.805	nw.	26	nw.	9	17	13	13	5	
Des Moines.	849	29.20	-0.01	30.16	30.65	11 29.51	4.1.14	10.9	8.0	36.6	1	18.3	24.0	9	3.5	60.6	28.7	12	4.1	177.7	5.3	3.47	+2.45	4.557	n.	20	ne.	3	19	15	11	5	
Dubuque.	665	29.36	0.00	30.11	30.55	11 29.47	3.1.09	12.7	5.9	37.8	2	19.0	21.1	10	5.3	60.9	29.6	22	4.0	157.9	7.4	3.17	+1.71	3.296	nw.	16	nw.	8	21	10	15	5	
Keokuk.	618	29.41	-0.05	30.10	30.59	11 29.51	4.1.08	14.6	9.5	52.3	1	22.9	18.7	9	7.0	71.0	31.2	16	5.2	186.6	11.3	2.68	+0.42	6.443	nw.	24	nw.	8	14	13	12	7	
Calo.	359	29.71	-0.01	30.10	30.65	11 29.60	3.1.04	25.4	9.7	57.2	2	32.4	9.0	9	17.4	66.2	36.6	8	3.7	28.8	19.3	3.82	+0.37	6.499	w.	33	sw.	3	16	13	11	7	
Springfield.	644	29.37	-0.01	30.07	30.55	11 29.48	3.1.00	22.7	3.9	58.0	3	33.6	12.9	9	13.5	70.9	32.2	8	8.2	27.4	15.7	2.19	+0.14	7.895	nw.	29	n.	9	11	15	15	5	
Saint Louis.	571	29.47	-0.08	30.10	30.62	11 29.58	4.1.04	21.8	6.7	60.0	2	35.0	8.2	9	10.2	68.2	37.9	22	5.2	76.0	18.0	3.11	+0.94	9.057	nw.	44	nw.	6	13	10	13	8	
Missouri Valley.																																	
Lamar.	1,028	29.01	-0.04	30.14	30.71	11 29.63	4.1.08	19.3	6.2	62.0	2	28.7	16.0	9	10.2	78.0	34.1	22	3.0	423.5	15.0	2.91	+0.31	8.437	nw.	33	n.	22	14	15	7	9	
Leavenworth.	842	29.24	-0.02	30.18	30.74	11 29.58	3.1.16	14.4	11.2	45.5	1	23.0	20.5	9	5.8	66.0	36.7	7	4.2	470.5	8.4	1.60	+0.27	5.455	nw.	24	nw.	8	14	15	7	9	
Omaha.	1,113	28.97	+0.03	30.21	30.69	11 29.62	3.1.07	7.3	13.1	41.8	6	17.0	24.1	9	0.4	65.9	33.5	7	7.1	282.9	3.2	1.15	+0.60	8.749	n.	35	n.	4	15	7	10	6	
Valentine.	2,603	27.35	0.00	30.21	30.66	7 29.72	24.0.93	7.1	10.1	56.2	4	40.0	30.5	8	4.7	87.1	50.3	27	8.5	20.7	9.172	0.19	+0.09	9.172	n.	06	nw.	7	5	7	18	6	
Fort Sully.	1,307	28.74	+0.06	30.29	30.72	11 29.76	29.0.96	0.3	8.0	42.3	13	11.4	32.5	9	11.1	74.8	47.0	12	10.5	17.1	7.0	0.48	+0.34	6.668	nw.	34	nw.	7	13	5	18	8	
Huron.	1,228	28.83	+0.05	30.25	30.69	11 29.69	30.1.00	5.0	9.8	42.1	13	14.5	27.5	9	4.8	69.6	40.3	12	8.4	84.5	1.3	0.43	-0.08	6.656	nw.	39	nw.	8	9	8	15	8	
Northern slope.																																	
Fort Assinaboine.	2,720	27.22	+0.06	30.28	30.91	6 29.79	27.1.12	0.4	10.4	46.1	29	9.0	49.3	22	11.7	95.4	42.9	27	7.2	25.6	-10.2	1.50	+0.31	7.005	sw.	45	sw.	27	9	9	15	7	
Fort Benton.	2,681	27.29	0.00	30.27	30.93	6 29.79	27.1.14	3.5	9.7	49.1	4	10.7	51.0	22	6.4	143.1	43.1	27	8.6	29.8	-2.0	0.67	+0.15	1.568	ne.	20	sw.	29	9	14	12	5	
Fort Maginnis.	4,340	25.44	0.00	30.21	30.57	7 29.77	23.0.80	9.4	8.1	49.7	12	20.9	33.2	21	2.1	82.9	50.4	6	4.3	9.6	-3.5	2.28	+0.90	9.117	w.	50	e.	20	14	13	13	5	
Fort Shaw.	3,550	26.33	0.00	30.20	30.60	7 29.69	23.0.98	7.5	9.8	50.9	29	20.4	41.0	22	4.5	91.9	57.5	26	8.0	21.0	-14.3	0.85	+0.40	6.712	w.	44	w.	21	12	3	17	11	
Helena.	4,044	25.78	-0.05	30.26	30.70	7 29.68	24.1.03	10.1	6.1	49.3	29	21.2	30.8	7	1.4	79.5	55.0	6	7.7	30.1	-2.3	0.81	+0.09	4.547	n.	42	sw.	30	11	9	18	4	
Poplar River.	2,030	28.00	0.00	30.26	30.96	7 29.80	27.1.06	8.0	10.7	41.0	27	4.1	49.1	19	19.0	90.1	44.0	27	10.9	24.8	-11.1	1.40	+0.13	3.931	w.	33	w.	27	10	7	16	8	
Deadwood.	4,600	25.28	+0.03	30.23	30.53	7 29.71	21.0.82	14.7	7.1	48.7	27	24.8	33.7	7	5.0	72.4	55.3	21	4.1	18.7	-8.7	1.28	+0.17	2.537	ne.	33	sw.	21	14	3	14	4	
Cheyenne.	6,105	23.85	-0.04	30.11	30.48	28 29.75	19.0.64	21.6	3.3	51.4	24	32.1	27.0	7	8.8	78.4	43.0	6	11.1	31.7	-14.4	0.55	+0.28	10.213	nw.	52	nw.	21	10	3	20	8	
North Platte.	2,841	27.10	+0.01	30.20	30.54	7 29.83	21.0.71	15.9	3.9	52.0	25	26.1	21.2	8	6.4	73.2	45.6	21	7.8	15.9	-10.4	0.09	+0.47	5.748	nw.	32	nw.	7	6	2	19	10	
Fort Laramie.	2,720	27.22	+0.06	30.28	30.91	6 29.79	27.1.12	0.4	10.4	46.1	29	9.0	49.3	22	11.7	95.4	42.9	27	7.2	25.6	-10.2	1.50	+0.31	7.005	sw.	45	sw.	27	9	9	15	7	
Middle slope.																																	
Denver.	5,394	24.65	-0.02	30.16	30.43	11 29.78	19.0.65	20.8	6.9	62.8	24	35.0	18.9	8	8.8	81.7	56.7	19	7.3	16.6	-10.5	0.62	+0.02	5.796	n.	42	w.	30	1	2	15	14	
Pike's Peak.	14,134	17.49	0.00	30.18	30.46	4 29.81	18.0.65	2.0	0.6	18.9	25	8.2	39.8	7	4.0	48.7	26.5	2	4.8	21.0	-0.2	0.44	+2.52	19.003	w.	88	w.	22	13	5	13	5	
West Las Animas.	3,899	26.01	-0.03	30.12	30.40	7 29.77	18.0.63	17.9	2.2	52.1	24	29.0	31.2	1	0.9	73.6	41.0	23	5.2	17.8	-14.1	0.68	+0.47	5.202	w.	34	n.	7	11	7	10	8	
Concordia.	1,354	28.64	0.00	30.18	30.66	11 29.72	30.0.77	10.5	9.4	42.5	30	20.1	27.8	8	2.0	64.2	40.7	12	4.9	3.0	-8.0	0.62	+0.10	7.880	n.	38	n.	7	9	12	10	7	
Dodge City.	2,517	27.43	-0.01	30.14	30.55	11 29.78	30.0.77	10.5	9.4	42.5	30	20.1	27.8	8	2.0	64.2	40.7	12	4.9	3.0	-8.0	0.62	+0.10	7.880	n.	38	n.	7	9	12	10	7	
Fort Reno.	2,517	27.43	-0.01	30.14	30.55	11 29.78	30.0.77	10.5	9.4	42.5	30	20.1	27.8	8	2.0	64.2	40.7	12	4.9	3.0	-8.0	0.62	+0.10	7.880	n.	38	n.	7	9	12	10	7	
Fort Supply.	2,517	27.43	-0.01	30.14	30.55	11 29.78	30.0.77	10.5	9.4	42.5	30	20.1	27.8	8	2.0	64.2	40.7	12	4.9	3.0	-8.0	0.62	+0.10	7.880	n.	38	n.	7	9	12	10	7	
Fort Elliott.	2,650	27.85	+0.01	30.16	30.50	10 29.79	30.0.71	25.2	5.8	60.0	20	39.1	9.6	8	14.3	69.6	40.4	24	8.2	16.7	-18.7	0.02	+0.31	10.037	nw.	59	n.	22	6	5	9	17	
Southern slope.																																	
Fort Sill.	1,300	28.87	0.00	30.17	30.66	11 29.77	30.0.89	27.3	8.5	68.0	20	40.4	5.0	8	17.8	73.0	43.9	7	8.2	17.1	-18.5	0.42	-0.76	8.435	n.	49	n.	22	4	7	11	13	
Abilene.	1,745	28.27	0.00	30.15	30.59	9 29.80	30.0.79	34.9	10.0	72.4	20	49.2	2.8	8	24.1	75.2	52.0	4	9.1	16.7	-24.7	0.11	+0.02	8.077	n.	44	nw.	20	6	5	11	15	
Fort Davis.	4,928	25.15	-0.04	30.09	30.31	4 29.73	10.0.58	42.8	0.4	73.3	25	50.4	3.8	3	30.0	72.5	40.9	8	9.2	12.6	-20.8	0.22	+0.41	6.455	sw.	32	sw.	6	4	1	25	5	
Fort Stanton.	2,888	27.85	+0.01	30.16	30.50	10 29.79	30.0.71	25.2	5.8	60.0	20	39.1	9.6	8	14.3	69.6	40.4	24	8.2	16.7	-18.7	0.02	+0.31	10.037	nw.	49	nw.	20	3	3	11	17	
Southern plateau.																																	
El Paso.	3,764	26.28	-0.01	30.13	30.42	8 29.79	10.0.72	43.5	1.0	71.1	25	55.4	11.0	8	3.1	62.1	39.9	24	10.5	2.5	-23.2	25.3	0.31	-0.31	3.623	nw.	28	w.	20	2	4	9	18
Lava.	7,020	23.18	-0.04	30.18	30.42	29 29.77	10.0.65	43.4	0.6	66.2	24	51.6	0.8	3	25.3	58.6	30																

Mount Washington, New Hampshire: an aurora of a pale green color was observed at 8.28 p. m. of the 1st, having an altitude of about 10°.

Saint Vincent, Minnesota: an aurora was observed at 7.20 p. m. of the 2d, extending from 170° to 270° azimuth, consisting of a poorly defined arch, of 15° altitude above a dark segment, from which a few streamers were observed to shoot up to an altitude of about 30°; the display lasted until daylight of the 3d.

Pensacola, Florida: the Signal Service observer at this place reports that a pale white light resembling a faint aurora was observed in the southwest between 10 and 11 p. m. of the 7th, characterized by recurring fits of brilliancy, and was seen until the sky became obscured.

Saint Vincent, Minnesota: an aurora was observed at 9.40 p. m. of the 8th, consisting of a poorly defined arch of whitish color, extending from 160° to 260° azimuth and with an altitude of 15°; the dark segment was well defined; at 6.20 a. m. of the 9th the arch formation changed to that of slender beams extending from 145° to 270° azimuth, several of which attained an altitude of 45°; the display faded away at daylight.

Fort Totten, Dakota: an auroral light was observed at 9.45 p. m. of the 8th, having an altitude of 20° and azimuth 100°; an occasional streamer was seen; the aurora continued until 5 a. m. of the 9th.

Saint Vincent, Minnesota: an auroral arch extending from 170° to 270° azimuth, with an altitude of 30°, was observed at 9 p. m. of the 9th, the lower edge was well defined, showing clearly the dark segment; at 10.30 p. m. the arch broke, when the aurora assumed the appearance of several irregular patches of white light from which numerous streamers of a pale yellow color shot up to an altitude of 45° to 60°, having a rapid lateral motion from right to left; the display continued until 1.15 a. m. of the 10th.

Captain M. de Josselin, of the s. s. "Saint Laurent," reports that an aurora was observed from 4.45 to 6 a. m. of the 9th, extending from west-northwest to northeast; the rays were red and white and had an altitude of 70° above the horizon; stars of the first magnitude were visible through the white rays. The ship's position at 5 a. m. was latitude 44° 30' north, longitude 53° 3', west of Paris.

Poplar River, Montana: an auroral arch was observed from 8.50 to 11.30 p. m. of the 9th, having an altitude of 15°; a dark segment was observed to the left of the arch.

Yankton, Dakota: a faint auroral arch with a few indistinct streamers was observed from 7 to 8.30 a. m. of the 9th.

Fort Smith, Arkansas: an auroral band of a silvery color, narrow but well defined, extending from the horizon to about 40° in altitude, was observed at 3 a. m. of the 11th; the upper extremity was very bright while the lower end was surrounded by a diffuse light of a reddish color.

Saint Vincent, Minnesota: an aurora was observed at 6.15 a. m. of the 14th, consisting of a pale diffused light extending from 170° to 250° azimuth with an altitude of 15°; a few streamers were noticed at intervals shooting up to an altitude of 25°.

Manistique, Schoolcraft county, Michigan: an aurora was observed at 8.30 p. m. of the 28th, of 200° azimuth; at 1.29 a. m. of the 29th it extended from 135° to 270° azimuth with an altitude of 35°, at which time it was a bright yellow diffuse light; at 2.30 a. m. it was covered by cirro-stratus clouds.

Saint Vincent, Minnesota: a faint auroral light was observed at 9 p. m. of the 28th, extending from 160° to 250° azimuth with an altitude of 20°; the display lasting until after midnight.

Escanaba, Michigan: an auroral arch above a narrow segment was observed from 10.35 to 11.26 p. m. of the 29th; the color was a bright orange; the arch extended from the northwest to the northeast points of the compass, and had an altitude of about 40°.

Manistique, Schoolcraft county, Michigan: an auroral arch, 8° in width, was observed from 8 p. m. of the 29th until daylight of the 30th, having an altitude of 25°, and extending from 135° to 225° azimuth.

Manistique, Schoolcraft county, Michigan: a moderately bright auroral arch was observed from 7.30 to 8.30 p. m. of the 30th; the arch was 10° in width, and had an altitude of 25°; cirro-stratus clouds were seen beneath the arch.

The following stations report auroras, the observers giving dates only:

1st.—Kent's Hill and Cornish, Maine; Fort Totten, Dakota; Winnipeg, Manitoba.

2d, 3d, 4th.—Winnipeg, Manitoba.

7th.—Cambridge, Massachusetts (suspected).

8th.—Kent's Hill, Maine; Winnipeg, Manitoba; Fredericton, New Brunswick.

9th.—Fort Totten, Dakota; Yutan, Nebraska; Winnipeg, Manitoba.

10th.—Fort Totten, Dakota; Yutan and Harvard, Nebraska; Winnipeg, Manitoba.

11th.—Reidsville, North Carolina; Winnipeg, Manitoba.

12th, 14th, 20th.—Oakland, California.

14th.—Winnipeg, Manitoba.

22d, 23d, 26th.—Winnipeg, Manitoba.

28th.—Webster and Fort Totten, Dakota; Moorhead, Minnesota; Winnipeg, Manitoba.

29th.—Bismarck, Dakota; Riley, Illinois; Manistique and Mackinaw, City, Michigan; Madison, Wisconsin; Duluth, Minnesota.

30th.—Winnipeg, Manitoba.

THUNDER-STORMS.

Thunder-storms were reported in the various states and territories, as follows:

Alabama.—Montgomery, 3d, 20th; Mobile, 3d; Birmingham, 2d, 3d; Greensborough, 1st, 3d.

Arizona.—Fort Apache, 19th.

Arkansas.—Fort Smith and Lead Hill, 2d; Little Rock, 26th.

California.—Sacramento, 20th; Los Angeles, 19th; Fall Brook and Poway, 16th; Salinas and Cahuenga Valley, 18th, 19th.

Florida.—Sanford, Cedar Keys, Archer, Merritt's Island, and Fort Meade, 24th; Key West, 23d; Pensacola, 8th, 18th, 31st.

Georgia.—Atlanta and Milledgeville, 21st; Quitman, 24th.

Illinois.—Peoria, 3d.

Kansas.—Fort Scott, 2d.

Louisiana.—New Orleans, 3d, 18th; Liberty Hill, 2d, 26th; Grand Coteau, 1st, 2d, 18th, 22d; Shreveport, 1st, 2d; Morgan City, 18th; Point Pleasant, 2d, 7th, 26th.

Missouri.—Centerville, 3d.

Montana.—Helena, 24th.

Nebraska.—Fairbury, 20th.

North Carolina.—Charlotte, Smithville, and Lincolnton, 21st; Fort Macon, 21st, 31st; Weldon, 31st.

Oregon.—Astoria, 20th; Albany, 23d.

Pennsylvania.—Quakertown, 4th, 5th; Dillingersville, 5th.

South Carolina.—Charleston, Stateburg, and Aiken, 21st; Spartanburg, 21st, 29th.

Tennessee.—Nashville, Memphis, and Milan, 2d.

Texas.—Palestine, 1st, 2d; San Antonio, New Ulm, and Cleburne, 1st; Galveston, 17th, 18th, 22d; Brownsville, 22d.

Utah.—Salt Lake City, 21st, 25th.

Wyoming.—Fort Bridger, 21st.

ELECTRICAL PHENOMENA.

Dodge City, Kansas: the atmosphere during the 7th was highly charged with electricity; the batteries were removed from the telegraph lines and messages sent between this place and Fort Supply, Indian Territory; the sky being obscured, no aurora was observed; at the Western Union telegraph office sparks from five to six inches long flew from the key.

Fort Supply, Indian Territory: the atmosphere was so heavily charged with electricity on the 7th that upon opening the key a continuous stream of electricity could be seen passing from the key to the anvil, and of sufficient intensity to light a match when the head was placed near the anvil.

Captain Joseph Collier, of the s. s. "Cholmley," in the Straits of Gibraltar on the 27th, experienced heavy squalls, with thunder, lightning, and hail, during which the masts, spars, and all pointed objects were tipped with a phosphorescent light.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories, as follows:

Alabama.—10th.
Arizona.—7th to 10th.
California.—7th, 8th, 9th, 11th, 13th, 15th, 25th, 27th.
Colorado.—7th, 12th, 28th.
Connecticut.—3d, 8th, 11th, 20th.
Dakota.—1st, 8th, 14th, 16th, 17th, 18th, 20th, 23d, 26th.
Florida.—1st, 3d, 8th, 17th, 21st to 24th.
Georgia.—14th, 22d.
Idaho.—8th, 9th.
Illinois.—1st, 6th, 9th.
Indiana.—12th, 17th, 22d, 27th, 30th.
Indian Territory.—21st.
Iowa.—9th, 10th, 11th, 16th, 21st, 22d, 29th.
Kansas.—8th, 9th, 12th, 16th, 21st, 22d.
Kentucky.—12th.
Maine.—11th, 13th.
Maryland.—26th.
Massachusetts.—18th, 31st.
Michigan.—1st, 2d, 8th, 12th.
Minnesota.—4th, 19th, 23d.
Montana.—18th, 25th.
Nebraska.—17th.
Nevada.—10th, 18th.
New Jersey.—18th, 20th.
New Mexico.—16th.
New York.—2d, 8th, 15th, 16th, 18th, 20th, 23d.
North Carolina.—27th.
Ohio.—1st, 12th, 13th, 14th, 20th, 21st, 24th, 30th.
Pennsylvania.—8th, 15th.
South Carolina.—1st, 12th, 23d.
Tennessee.—1st, 6th, 9th, 14th, 17th, 20th, 30th.
Utah.—11th.
Virginia.—1st, 2d, 8th, 15th, 18th.
Washington Territory.—19th.
Wisconsin.—9th, 10th, 12th, 21st, 22d, 23d, 29th.
Wyoming.—1st, 3d, 9th to 13th, 16th, 17th.

LUNAR HALOS.

Lunar halos were observed in the various states and territories, as follows:

Alabama.—17th.
Arizona.—9th, 11th, 15th, 16th, 18th, 20th.
Arkansas.—11th, 16th, 21st.
California.—11th, 13th to 16th, 19th, 20th, 22d, 26th.
Colorado.—10th, 11th, 13th, 14th, 18th, 20th, 25th.
Connecticut.—10th, 16th, 18th.
Dakota.—1st, 13th, 14th, 16th to 20th.
District of Columbia.—12th, 20th, 22d.
Florida.—15th, 17th, 18th.
Georgia.—14th, 17th, 18th, 22d.
Idaho.—11th, 21st, 28th.
Illinois.—17th, 19th, 21st, 22d, 24th, 26th.
Indiana.—14th, 16th, 17th, 19th, 22d.
Indian Territory.—16th.
Iowa.—7th, 12th, 16th, 17th, 21st, 22d, 23d.
Kansas.—8th, 10th, 16th, 20th, 21st, 24th.
Kentucky.—14th, 17th.
Maine.—11th, 16th, 18th, 20th.
Maryland.—12th, 15th, 22d.
Massachusetts.—12th, 16th, 18th, 19th, 20th.
Michigan.—10th, 12th, 13th, 14th, 19th, 21st.
Minnesota.—13th to 18th.
Montana.—14th to 18th, 22d.

Nebraska.—15th, 16th, 17th, 22d, 25th.
Nevada.—10th, 11th, 15th, 24th.
New Hampshire.—11th, 15th, 18th, 24th.
New Jersey.—15th, 18th, 20th.
New Mexico.—10th, 11th, 13th, 15th, 16th, 17th.
New York.—8th, 14th, 15th, 16th, 18th, 20th, 21st.
North Carolina.—17th, 19th.
Ohio.—2d, 10th, 11th, 12th, 14th, 21st, 22d.
Oregon.—17th.
Pennsylvania.—12th, 15th, 19th, 20th.
South Carolina.—12th, 15th, 17th, 18th, 19th.
Tennessee.—14th, 17th, 19th.
Texas.—11th, 12th, 14th, 15th, 16th, 20th, 21st, 22d, 24th, 25th, 26th.
Utah.—25th.
Vermont.—15th, 16th, 18th, 23d.
Virginia.—12th, 13th, 15th, 17th to 20th.
Washington Territory.—15th, 19th.
West Virginia.—12th, 14th, 19th.
Wisconsin.—10th, 19th.
Wyoming.—12th, 15th, 17th, 18th.

The phases of the moon during January were: new moon, 4th, 2.35 a. m.; first quarter, 12th, 7.16 a. m.; full moon, 19th, 2.36 a. m.; last quarter, 26th, 8.23 p. m.; apogee, 6th, 4.01 a. m.; perigee, 19th, 8.02 p. m.

MIRAGE.

Cahuenga Valley, California, 30th.
Cedar Keys, Florida, 19th.
Harvard, Nebraska, 25th.
Fort Grant, Arizona, 24th, 25th, 27th.
Reidsville, North Carolina, 7th.
Saint Vincent, Minnesota, 11th, 12th.

MISCELLANEOUS PHENOMENA.

SUN SPOTS.

Prof. David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for January, 1886:

Date— January, 1886. Standard time.	No. of new.		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 4 p. m.	1	3					2	20 ¹	
2, 4 p. m.	1	10 ¹	0	5 ¹	1	10 ¹	3	25 ¹	
3, 3 p. m.	0	40 ¹					2	60 ¹	
5, 8 a. m.	1	10 ¹					2	35 ¹	
10, 4 p. m.	0	5 ¹					2	40 ¹	Two spots quite large.
11, 2 p. m.	0	0	0	0	0	0	2	40 ¹	
12, 3 p. m.	0	15 ¹	0	0	0	0	2	55 ¹	
13, 2 p. m.	1	60 ¹	0	5 ¹	1	15 ¹	4	110 ¹	
14, 4 p. m.	0	10 ¹	0	5 ¹	0	10 ¹	4	115 ¹	
15, 2 p. m.	0	0	1	3	0	0	3	110 ¹	One of the spots very large.
18, 10 a. m.	2	6					5	85 ¹	One of the spots very large.
20, 11 a. m.	0	0			0	0	5	20 ¹	Broad areas of facule.
23, 12 m.	0	0			0	0	0	0	
26, 12 m.	0	0	0	0	0	0	0	0	
31, 10 a. m.	1	5	0	0			1	5	

Facule were seen at the time of every observation.

† Approximated.

Mr. H. D. Govey, of North Lewisburg, Champaign county, Ohio, reports having observed sun spots on the following dates: 1st, 4th, 7th, 11th to 14th, 17th, 19th, 30th.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and sixty stations show 4,933 observations to have been made, of which four were reported doubtful; of the remainder, 4,929, there were 4,349, or 88.2 per cent., followed by the expected weather.

EARTHQUAKES.

Nashua, Hillsborough county, New Hampshire: an earthquake shock of about ten seconds' duration was generally felt in this section of the state at 5.14 p. m. of the 17th; it was accompanied by a noise similar to that made by a heavy wagon drawn rapidly over frozen ground, or deep thunder; vibration, if any, probably from north to south.

Grand Coteau, Saint Landry parish, Louisiana: a slight shock of earthquake was felt at 10.38 a. m. of the 22d.

Prof. C. G. Rockwood, jr., Princeton, New Jersey, furnishes the following account of earthquakes that occurred during January, 1886:

A slight shock of earthquake was reported at 5 a. m. of the 7th in the western part of Seneca county, New York; inquiry in these regions by circular failed, however, to discover any ground for the report. Replies received from Auburn, Romulus, Hector, and Syracuse agree that no shock was felt. Mr. J. F. Boynton, of Syracuse, says: "After diligent inquiry of many persons, I cannot give any knowledge of an earthquake here, except an announcement in a New York paper."

The New Haven (Connecticut) "Palladium," of January 14th, contained a dispatch from Winsted, Connecticut, announcing that two or three persons in the house of Rollin H. Cook felt what was supposed to be a very slight shock of earthquake at 4.15 p. m. of the 9th; it was not felt by any others, as far as known.

Guayaquil, Ecuador, January 14th: There have been, at different places, showers of earth and ashes, accompanied by loud rumblings; the volcano Cotopaxi is supposed to be in eruption; the real state of the mountain is unknown, owing to the breaking down of the government telegraph lines. Slight shocks of earthquake have also been felt.—*New York Tribune, January 15th.*

The earthquake reported from Bordentown, Hightstown, Hammonton, and Princeton, New Jersey, at 5.15 p. m. of the 15th, was due to an explosion of dynamite at Toms River, New Jersey.

The earthquake reported at Nyack, New York, about midnight of the 15th, was caused by an explosion of dynamite in Westchester county, New York.

Mexico, January 20th: A telegram from Colima was received by the government stating that on the morning of the 15th another eruption of the volcano occurred. Enormous stones were thrown to a great height and were plainly visible from this city. (Colima is twenty-five miles distant.) Photographs of the volcano at the moment of its greatest activity were taken by the instantaneous process. A vast white cloud still overhangs the crater, and on it the flames are beautifully reflected.—*New York Tribune, January 21st.*

January, 24th: In the southern part of Dutchess county, New York, a number of persons in the vicinity of Hopwell Junction and Brinckerhoffville felt, at 7.04 p. m., a shock supposed to be a slight shock of earthquake; it was sufficiently strong to rattle windows and displace light objects and was accompanied by a loud noise like a distant explosion or the rumbling of a farm wagon. Two shocks in close succession were reported, lasting about fifteen seconds. Another observer states that only one shock was felt and lasted not over two seconds. It was only felt in a very limited district and was not felt at Poughkeepsie or Kingston.

PRAIRIE FIRES.

Richardton, Dakota, 5th.

Fort Sill, Indian Territory, 23d, 24th, 29th.

METEORS.

Fort Bridger, Wyoming: meteors were observed before daylight and during the evening of the 2d.

Wytheville, Wythe county, Virginia: an unusual number of small meteors were observed at 5.40 a. m. of the 2d; the largest was of a whitish color and about the size of Jupiter; it left a trail which lasted one to two seconds.

The following description of a meteor is furnished by Rev. John G. Hagen, S. J., voluntary observer at the College of the Sacred Heart, Prairie du Chien, Wisconsin:

At 9.49 p. m. (central time) of the 16th a brilliant meteor was observed that suddenly illuminated the whole country, although the moon was nearly full; it first appeared due west of Prairie du Chien at an altitude of 40°, and moved in a southeasterly direction, describing an arc of 92°, and disappeared at an altitude of 40°, in the direction of Dubuque, Iowa, 30° east of our meridian. The highest altitude, 58°, was reached 30° west of the meridian, in the direction of Masonville, Iowa. Its path among the stars went from δ Andromedæ, near α Tauri, and α Prionis, to the star 22 Flamsteed Monocerotis. Its apparent diameter was estimated at one and a half times that of the full moon; its light was first a mild blue, which afterwards changed into red. There were three explosions, the first in the constellation of Aries, azimuth 80° west, the second at greatest height, azimuth 30° west, just below the moon, and the third in 20° eastern azimuth, shortly before it disappeared; after each explosion a trail was formed about 15° long, some fragments showed as bright as Venus; the whole phenomenon may have lasted from five to eight seconds. One of the observers thought to have heard some hissing noise, right after the explosion, but it was not until 2.2 minutes later that several loud reports were heard from the south like far distant thunder, and many faint ones in quick succession. The observer looked at his watch about half a minute after the appearance of the meteor, and, therefore, the interval of 2.2 minutes between light and sound may be uncertain within two-tenths of a minute; this would give a distance of twenty-seven miles in the air line, or thirteen miles in a horizontal direction and more than twenty miles in height. According to very vague reports, the meteor was seen in Decorah, Waukon, and Dubuque, Iowa; Lancaster, Wisconsin; and Galena, Illinois.

Mr. W. B. Sherman, voluntary observer at Manchester, Delaware county, Iowa, reports the following:

At 9.50 p. m. of the 15th (?) a meteor appeared in the northwest about 60° above the horizon and appeared to be about eight inches in diameter; it passed directly east, and when a little east of north a fragment about the size of a man's hand fell perpendicularly three degrees, which was followed shortly after by another piece similar to the first, both of which exploded like a rocket; in a few seconds the explosion was followed by a rumbling noise like distant thunder. Although the moon was shining bright, the light of the meteor was so intense that people hurried out doors to see if some building was not burning; the nebula disappeared in the northeast, 44° above the horizon.

[NOTE.—The meteor reported by Mr. Sherman was probably observed on the 16th, as the sky throughout Iowa was obscured on the 15th, and reports from other sources mention this meteor as having occurred on the 16th.—C. S. O.]

West Union, Fayette county, Iowa: a brilliant meteor was observed, moving in a southeasterly direction, at 9.45 p. m. of the 16th; two explosions occurred east of this place.

Dubuque, Iowa: a brilliant meteor, of a pale rose color, was observed at 10.50 p. m. of the 16th; it started from the northwest portion of the sky at an altitude of about 20°, and moved towards the southeast; when within 20° of the zenith it burst into three pieces.

Cedar Rapids, Linn county, Iowa: a brilliant meteor was observed at 10 p. m. of the 16th, which remained in sight for several seconds.

Mankato, Blue Earth county, Minnesota: at 9.45 p. m. of the 16th a brilliant meteor appeared in the south, moving east of south, at an altitude of 20° above the horizon, visible from fifteen to twenty seconds, at first bright yellow, then orange, and just before fading, a greenish tinge; for a brief time it made a very vivid light.

Bancroft, Kossuth county, Iowa: at 9.48 p. m. (central time) of the 17th a meteor was observed, moving about 15° south of east, lighting up the whole country like an electric light.

Meteors were also observed in the various states and territories, as follows:

Connecticut.—Bethel, 30th.

Dakota.—Webster, 3d.

Florida.—Archer, 30th.

Illinois.—Anna and Peoria, 17th.

Iowa.—Monticello, 9th, 16th, 27th; Oskaloosa, 22d; Cedar Rapids, 6th.

Kansas.—Wakefield, 5th.

Maryland.—Woodstock, 7th.

Nebraska.—Crete, 5th, 30th, 31st; Harvard, 12th.

New Hampshire.—Nashua, 12th.

New Jersey.—Dover, 2d, 22d.

Ohio.—Wauseon, 6th; Tiffin, 23d.

South Carolina.—Spartanburg, 4th, 7th.

Texas.—Midland, 28th.

Virginia.—Variety Mills, 5th; Dale Enterprise, 13th.

POLAR BANDS.

Florida.—Archer, 16th, 17th, 18th, 20th, 23d, 31st.

California.—San Diego, 16th.

Colorado.—Montrose, 15th, 27th.

Kansas.—Yates Centre, 16th.

Maine.—Portland, 13th.

Massachusetts.—Somerset, 16th.

New York.—New York City, 23d.

Ohio.—Wauseon, 1st; Napoleon, 1st, 22d.

South Carolina.—Stateburg, 1st.

Tennessee.—Nashville, 1st, 6th.

Texas.—El Paso, 18th.

Virginia.—Variety Mills, 10th; Wytheville, 1st, 12th, 13th, 15th, 17th; Dale Enterprise, 6th, 15th, 20th.

Wyoming.—Fort Bridger, 8th to 11th.

SAND STORMS.

Midland, Midland county, Texas: a heavy sand storm occurred at 10 a. m. of the 26th, during which it was impossible to see objects one hundred rods distant.

Sand storms were also reported from the following stations:

Abilene, Texas, 26th.
El Paso, Texas, 19th.
Yuma, Arizona, 1st, 7th, 8th, 25th.
Los Angeles, California, 1st.

SHOWER OF DUST.

Austin, Travis county, Texas: about 4 p. m. of the 26th, a shower of very fine dust began falling from a clear sky; there was no wind at the time; the shower increased towards evening and continued late into the night. The dust had a peculiar effect on the lungs and throat, causing irritation and hoarseness. A similar phenomenon occurred at this place eight years ago.

WATER-SPOUTS.

Captain H. L. Higgins, of the s. s. "Excelsior," reports that between latitude 28° and 30° N. and longitude 79° 50' and 79° 25' W., he passed four large and several small water-spouts.

Captain Wohlmuth, of the bark "Betty," at 5 p. m. of the 30th, when in latitude 29° 57' N. and longitude 64° 30' W., saw a water-spout moving from southwest to northeast; another was observed at 5.30 p. m.

The British s. s. "Cholmley," when twenty-eight miles north of Madeira, on the 31st, saw a water-spout traveling in a northeasterly direction at the rate of about fifteen miles per hour, and seeming to revolve very rapidly during its progress. Its duration was about fifteen or twenty minutes.

MIGRATION OF BIRDS.

Geese flying northward.—Fort Madison, Iowa, 31st; Ashwood, Tennessee, 20th; Ocean City, Maryland, 12th, 25th, 29th; Augusta, Georgia, 7th, 21st; Yuma, Arizona, 4th; Fort Bidwell, California, 31st.

Geese flying northeastward.—Eastport, Maine, 3d.

Geese flying southward.—Portland, Oregon, 28th.

Ducks flying northward.—Ocean City, Maryland, 25th.

Ducks flying eastward.—Knoxville, Tennessee, 11th.

Ducks flying southward.—Salina, Kansas, 27th; Vicksburg, Mississippi, 8th; Knoxville, Tennessee, 4th, 8th.

Meteorological record of voluntary observers and Army post surgeons, January, 1886.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature.				Stations.	Temperature.			
	Maximum.	Minimum.	Mean.	Rainfall.		Maximum.	Minimum.	Mean.	Rainfall.
<i>Alabama.</i>				<i>Inches</i>	<i>Connecticut.</i>				<i>Inches</i>
Birmingham	62	0	7.07		Bethel	54	-18	23.4	4.72
Greensborough	65	2	39.4		Hartford	54	-18	23.4	4.60
Mount Vernon H'n.	73	10	44.4	7.12	North Colebrook	56	-17	17.6	5.65
<i>Arizona.</i>					Southington	56	-18	22.8	3.93
McDowell, Fort	77	19	49.6	3.30	Voluntown	56	-18	22.8	6.40
Tucson				1.61	<i>Dakota.</i>				
<i>Arkansas.</i>					Abr. Lincoln, Fort	34	-37	-5.7	0.94
Lead Hill	58	-13	34.3	2.45	Meade, Fort	52	-33	7.3	0.33
Mount Ida	50	-4	30	2.60	Pembina, Fort	34	-38	-11.9	3.25
<i>British Columbia.</i>					Randall, Fort	53	-29	8.0	0.41
New Westminster				9.43	Richardson	32	-40		1.10
<i>California.</i>					Siamon, Fort	45	-44	-4.6	0.60
Alcatraz Island	60	40	49.1	7.00	Sully, Fort	49	-39	2.4	0.11
Angel Island	68	34	50.6	7.17	Totten, Fort	32	-10	-10.1	0.80
Benicia Barracks	63	33	47.8	5.98	Vermillion	41	-30	4.5	1.37
Bidwell, Fort	55	-2	32.1	5.91	Webster	44	-40	0.0	1.24
Cahuenga Valley				7.65	Yates, Fort	35	-39	-2.4	0.25
Fall Brooks	79	31	53.5	9.70	<i>District of Columbia.</i>				
Hydesville				8.73	Distributing Res'r	56	-3	29.4	5.18
Mason, Fort	61	41	52.6	4.68	Receiving Res'r	56	-5	28.0	4.97
Murieta	77	21	49.5	10.66	Kendall Green	56	-4		2.40
Nicolaus	69	31	47.8	5.32	Rock Creek Bridge	58	0	32.4	
Oakland	64	30	49.4	8.12	<i>Florida.</i>				
Oroville	66	20	48.2	5.17	Archer	79	14	50.0	3.24
Poway	77	28	53.1	6.34	Limona	82	23	50.4	2.94
Presidio of San F	66	35	49.4	6.77	Manatee	85	23	52.3	2.56
Princeton	64	30	47.2	3.91	Merritt's Island	77	20	55.3	1.96
Sacramento	68	27	46.0	6.36	Saint Augustine, Ft	72	17	50.3	4.30
Salinas	68	29	49.2	5.10	Tallahassee	72	13	49.0	4.45
San Rafael	71	25	48.7	11.08	<i>Georgia.</i>				
Santa Barbara	85	35	53.0	5.12	Athens	65	1	37.0	6.47
Susanville	58	8	28.2	4.09	Forsyth	68	6	41.7	8.15
<i>Colorado.</i>					Milledgeville	69	6	39.8	7.31
Colorado Springs	60	-20	22.0		Quitman	72	13	47.4	3.55
Lyon, Fort	50	-19	18.3						
Pueblo	61	-17	31.9	0.55					

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature.				Stations.	Temperature.			
	Maximum.	Minimum.	Mean.	Rainfall.		Maximum.	Minimum.	Mean.	Rainfall.
<i>Idaho.</i>				<i>Inches</i>	<i>Massachusetts—Con.</i>				<i>Inches</i>
Boise Barracks	54	1	30.6	2.53	Heath	50	-20		
Coeur d'Alene	45	-12	22.8	2.50	Leicester	51	-14	20.8	6.62
<i>Illinois.</i>					Mendon	50	-11	23.2	
Anna	57	-14	24.3	3.18	Milton	54	-11	25.7	5.17
Bloomington	55	-24		2.00	New Bedford	47	-9	27.2	6.74
Bunker Hill	58	-14	18.7	3.55	Princeton	49	-15	20.7	5.28
Collinsville	55	-13	20.7	3.49	Somerset	52	-12	26.5	5.09
Charleston	55	-18	21.0	2.80	Taunton	53	-17	26.9	5.17
Geneseo	50	-22		2.81	Worcester	50	-8	21.9	6.52
Mattoon	54	-16	31.5	2.80	Westborough	55	-10	26.0	5.74
Peoria	56	-18	19.9	2.41	Williamstown	54	-17	19.2	3.92
Riley	45	-26	12.4	3.60	<i>Michigan.</i>				
Rockford	47	-22	14.3	5.87	Birmingham	49	-11		2.40
South Evanston	48	-24	15.6	3.33	Brady, Fort	38	-29	9.6	4.04
Swanwick	54	-11	22.1	2.63	Harrisville	51	-13		4.66
Windsor	54	-17	18.5	4.32	Hudson	49	-17		1.25
<i>Indian Territory.</i>					Kalamazoo	52	-6		3.80
Reno, Fort	58	-12	23.0		Lansing	40	-12	19.0	2.27
Supply, Fort	59	-14	21.4	0.76	Manistique	42	-22	17.1	4.55
<i>Indiana.</i>					Mottville	42	-18		1.75
Fort Wayne	53	-7	23.8	2.50	Pentwater	49	-5	19.8	3.36
Guilford	54	-14	25.1	2.95	Thornville	48	-6	20.4	2.72
Jeffersonville	60	-12	27.0	3.09	Traverse City	41	-13		5.49
Knightstown	54	-24	24.4	2.41	<i>Minnesota.</i>				
Laconia	50	-13		3.87	Minneapolis	31	-29	3.8	3.61
Lafayette	54	-23	19.1	1.75	Northfield	31	-26	3.6	3.91
LaGrange	52	-17	18.7	3.70	Snelling, Fort	30	-26		1.98
Logansport	56	-17	22.7	2.26	<i>Missouri.</i>				
Mauzy	53	-23	19.2	4.27	Centerville	57	-22		2.10
Spiceland	54	-18	21.9	3.75	Conception	39	-26	9.2	2.51
Sumner	54	-20	23.2	3.54	Frankford	53	-15		3.12
Terre Haute	55	-11		2.67	Pierce City	60	-18	31.2	2.10
Vevay	60	-14	27.0	3.57	Springfield	57	-20	21.5	1.55
<i>Iowa.</i>					<i>Montana.</i>				
Bancroft	34	-28	2.3	1.40	Astinaboine, Fort	46	-45	-1.3	0.12
Cedar Rapids	40	-28	10.8	2.48	Ellis, Fort	56	-37	12.3	0.88
Cedar Rapids	38	-28	8.7		Keogh, Fort	51	-45	12.7	0.50
Cresco	30	-33	4.5	3.72	Shaw, Fort	50	-43	7.2	0.85
Des Moines	42	-27	9.0		<i>Nebraska.</i>				
Independence	35	-26	9.1	3.69	Crete	40	-25	6.1	1.63
Logan				2.60	De Soto	35	-25	7.0	2.24
Fort Madison	48	-20		2.50	Fairbury	40	-24		
Manchester	37	-24	12.0	2.57	Fremont	33	-25	6.5	2.17
Monticello	38	-28	9.8	3.35	Genoa	39	-27	5.0	2.13
Mount Vernon	40	-30	10.0		Harvard	48	-30		
Muscataine	45	-21	14.2	4.21	Hay Springs	50	-31	10.4	0.55
Oskaloosa	49	-7	8.8	2.43	Marquette	35			1.90
Oskaloosa	39	-26		1.75	Niobrara, Fort	64	-27	9.2	1.8
West Union	34	-31	8.3	3.51	Robinson, Fort	56	-33	16.2	0.67
<i>Kansas.</i>					Sidney, Fort	58	-20	17.2	1.30
Allison	54	-16	13.6	2.50	Stockham	38	-26	15.3	3.00
Atchison	36	-19	12.8	1.54	Tecumseh	46	-26	11.4	2.00
Emporia	42	-19	15.5	1.03	Yutan	30	-28	6.6	2.30
Fort Scott	54	-16	31.2		<i>Nevada.</i>				
Hays, Fort	43	-23	12.7	1.52	Halleck, Fort				1.94
Independence	49	-14	18.6	1.58	McDermitt, Fort	51	-1	28.9	1.59
Manhattan	40	-20	11.0	0.96	<i>New Hampshire.</i>				
Manhattan	41	-19	13.3	2.50	Ashland				4.84
Ninnescah	43	-16	14.3	3.00	Belmont				4.78
Ottawa	43	-17	15.5	0.85	Bristol				0.61
Salina	40	-15	20.9	2.02	Lake Village				4.23
Riley, Fort	47	-25	11.2	0.58	Nashua	51	-23	22.0	3.86
Sterling	44	-18	13.7	1.45	Wier Bridge				3.93
Topeka	48	-20		1.36	Wolfborough				4.99
Wakefield	40	-17	13.4	0.55	Woodstock				4.71
Wellington	49	-17	17.6	1.53	<i>New Jersey.</i>				
W. Leavenworth	50	-18		0.98	Beverly	57	-4	26.7	4.20
Westmoreland	44	-20	14.0	3.62	Clayton	49	0	26.9	5.01
Wyandotte	41	-18	14.7	1.12	Dover	57	-30	25.5	5.59
Yates Centre	47	-16	15.8	1.64	Moorestown	45	-3	35.9	4.66
<i>Kentucky.</i>					Paterson	48	-4	27.0	4.61
Frankfort	59	-20	27.6	3.67	Phillipsburg	51	-6	23.9	2.92
Penrod	72	-22			Princeton	57	-4	26.2	4.66
Richmond	58	-14	26.5	4.53	Readington	56	-4	30.2	
<i>Louisiana.</i>					Vineland	60	-2	28.0	4.27
Grand Coteau	70	11	47.8	7.31	<i>New Mexico.</i>				
Liberty Hill	70	5	39.0	4.52	Bayard, Fort	75	-1	39.3	1.05
Luling	71	13	45.8	6.71	Gallinas Spring	72	0		1.05
Morgan City	66	15		6.80	Selden, Fort	75	9	41.6	Trace.
Point Pleasant	64	6	37.6	15.28	Union, Fort	59	-18	28.9	0.98
<i>Maine.</i>					Wingate, Fort	53	-12	27.2	2.52
Bar Harbor	46	-13		9.20	<i>New York.</i>				
Buckfield	50	-16		6.48	Auburn		-17	23.0	3.82
Cornish	46	-24	19.8	7.18	Columbus, Fort	53	-3	28.0	4.39
Gardiner	49	-24	19.5	0.61	Cooperstown	54	-24	18.3	1.83
Kent's Hill	47	-18	17.5	7.52	David's Island	45	3	26.3	4.93
Orono	48	-26	18.0	6.64	Factoryville	50	-18	20.1	3.42
Freble, Fort	45	-12	23.4	2.11	Humphrey	49	-11	19.3	2.35
Waterville	54	-25	20.7	7.00	Ithaca	54	-11	21.5	3.04
<i>Maryland.</i>					LeRoy	48	-7	20.9	1.98
Cumberland	56	-6	23.0	2.90	Madison Barracks	54	-26	16.3	2.62
Fallston	55	-1	26.6	0.00	Menand Station	53	-15	19.7	4.12
Great Falls	59	-6	26.7	3.46	Mountainville	50	-14	22.2	5.15
McDonogh	56	-4	27.7	3.86	Niagara, Fort	54	0	22.8	1.24
McHenry, Fort	54	3	30.2	4.58	North Volney	49	-17	18.0	4.55
Woodstock	59	-13	27.1	5.45	Palermo	46	-19	17.5	3.9

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature.			Rainfall.	Stations.	Temperature.			Rainfall.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
North Carolina.	°	°	°	Inches	Texas.	°	°	°	Inches
Chapel Hill.....	63	2	33.4	6.50	Austin.....	73	6	42.6	0.97
Lenoir.....	60	-12	23.5	6.50	Clark, Fort.....	95	10	47.7	0.12
Lincolnton.....	62	-7	31.1	6.19	Cleburne.....	72	-3	32.3	1.81
Raleigh.....	65	5	37.0	2.40	Comfort.....	76	6	38.0	0.56
Reidsville.....	69	-10	26.7	1.75	Concho, Fort.....	80	3	38.9	0.15
Statesville.....	61	-8	34.8	5.97	Corsicana.....	74	4	36.9	3.18
Wake Forest.....	65	2	36.0	2.99	Huntville.....	74	4	36.9	2.31
Weldon.....	63	8	34.7	2.88	McIntosh, Fort.....	75	-4	36.9	0.02
Ohio.					Ringgold, Fort.....	82	19	49.2	0.30
Cleveland.....	54	-8	24.3	3.17	Stratford.....	99	18	52.7	0.34
College Hill.....	56	-18	19.6	4.59	New Ulm.....	80	7	43.6	1.13
Fostoria.....	50	-11	20.5	3.03	Vermont.				
Garrettsville.....	53	-19	20.7	4.45	Brattleborough.....	56	-17	20.9	6.47
Hiram.....	52	-10	21.1	4.34	Burlington.....	54	-20	18.1	1.68
Jacksonborough.....	52	-19	23.0	4.30	Charlotte.....	45	-20	14.0	2.90
McConneville.....	58	-10	25.1	4.03	Dorset.....	54	-23	18.5	2.94
Napoleon.....	53	-9	22.7	2.85	Lunenburg.....	42	-23	15.0	2.65
North Lewisburg.....	53	-14	24.4	4.30	Newport.....	48	-28	14.8	3.48
Ruggles.....	52	-8	22.7	2.90	Poultney.....	56	-27	16.7	3.72
Tiffin.....	54	-9	21.5	2.43	Post Mills Village.....	47	-30	17.2	.....
West Milton.....	59	-14	25.0	4.00	Stowe.....	50	-24	.....	6.00
Wauseon.....	52	-14	19.0	2.78	Strafford.....	46	-26	16.0	4.60
Westerville.....	52	-12	23.3	3.16	Virginia.				
Yellow Springs.....	58	-14	20.3	3.67	Accotink.....	62	-9	29.7	4.29
Oregon.					Bird's Nest.....	57	10	35.4	3.15
Albany.....	57	18	35.8	9.92	Bruntington.....	57	6	.....	5.23
Bandon.....	54	26	42.4	13.72	Dale Enterprise.....	60	-12	28.2	5.95
East Portland.....	50	10	.....	5.8	Marion.....	58	-10	25.8	3.58
Eola.....	55	14	36.3	9.46	Monroe, Fort.....	60	8	34.3	1.92
Klamath, Fort.....	50	-13	27.8	3.62	Snowville.....	66	-6	.....	.....
Pennsylvania.					Summit.....	60	-12	27.8	.....
Blooming Grove.....	53	-15	22.1	3.90	University of Va.....	59	12	31.0	.....
Catawissa.....	60	-13	23.2	4.50	Variety Mills.....	62	-12	28.7	3.82
Dillingersville.....	58	0	26.6	6.25	Wytheville.....	59	-8	29.1	3.88
Dyberry.....	51	-18	19.9	2.85	Washington Territory.				
Easton.....	56	-3	25.8	4.12	Bainbridge Island.....	54	16	37.0	6.95
Fallington.....	56	-3	25.8	4.12	Kenewick.....	53	-16	21.0	.....
Franklin.....	56	-17	19.0	4.86	Pleasant Grove.....	51	22	2.62	.....
Germantown.....	52	-3	5.89	.....	Spokane, Fort.....	40	-14	19.4	1.32
Grampian Hills.....	50	-20	19.5	4.27	Tacoma.....	51	14	35.0	7.71
Quakertown.....	53	-4	24.0	3.68	Townsend, Fort.....	52	9	37.7	.....
Troy.....	49	-23	18.8	4.18	West Virginia.				
Wellsborough.....	52	-15	23.3	12.17	Clarkburg.....	62	-10	.....	2.11
West Chester.....	56	-3	25.4	3.98	Helvetia.....	62	-10	29.0	3.45
Wysox.....	53	-14	22.3	3.54	Parkersburg.....	60	-13	20.4	7.21
South Carolina.					Wisconsin.				
Aiken.....	66	6	40.5	3.40	Embarras.....	36	-30	11.6	4.35
Kirkwood.....	62	-3	34.2	2.61	Madison.....	35	-24	11.9	3.33
Pacolet.....	43	3	34.2	6.95	Manitowoc.....	41	29	17.2	3.80
Spartanburg.....	64	1	36.5	8.70	Neillsville.....	25	-48	-1.9	2.71
Stateburg.....	64	6	39.0	2.48	Prairie-du-Chien.....	35	-25	11.5	3.26
Tennessee.					Wausau.....	35	-38	8.9	3.08
Ashwood.....	57	-7	25.0	4.30	Wyoming.				
Austin.....	59	-19	30.8	2.66	Bridge, Fort.....	38	-10	20.4	4.19
Milan.....	59	-11	27.5	6.04	Fred Steele, Fort.....	44	-23	19.0	0.28
Paris.....	62	-14	29.2	.....	Washakie, Fort.....	50	-37	15.3	0.04
					McKinney, Fort.....	55	-40	13.9	1.00

NOTES AND EXTRACTS.

The following is an extract from the January, 1886, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., Auburn:

The severe weather of the month has rendered January the most remarkable season recorded in many years. All agricultural interests suffered greatly. The oats that were growing finely at the opening of the month were totally destroyed by the cold wave that began on the 8th. Considerable stock during this period were also killed where proper protection was not given, and even in those cases where special care was shown the cattle much suffering occurred. Ice and frost were frequent, and in many sections large streams were covered with such thick ice as to permit skating. A slight fall of snow was also reported from most stations.

The precipitation was in excess from 0.2 to 2 inches.

The following notes from the observers will be of interest:

Birmingham: "On the 8th the temperature fell 42°.5 in twenty hours, and remained below freezing six days—touching at, or near, zero on four successive mornings. The average for the six days (8-14th) was 14°.5. The ground was frozen to the depth of two feet or more, and ice formed four inches in thickness. Winter cabbage, carrots, turnips, leaves of mock orange, magnolia, and honeysuckle were killed. The damage to the fruit trees, if any, cannot be ascertained until spring. The high wind of the 15th did considerable damage to small buildings, and unroofed one or two large structures. On the 9th and 10th the air was filled with fine snow, which obscured the sun, giving the sky a smoky appearance."

Chattanooga: "The month of January, 1886, is one that will be long remembered by the inhabitants of Chattanooga. The mean annual January temperature is 40°.7, but January, 1886, was 7°.5 below the normal, and 18°.5 below the mean for January, 1880, also 11°.8 below that for the corresponding month in 1882. The minimum temperature, which was 6°.9 below zero on the 11th,

is 21°.4 below the average of the last seven years' minimum temperatures, the lowest recorded, in 1880, being 29° above. The state of the weather being clear and cloudy, shows that there were seventeen cloudy days during the month and but fourteen clear to fair. In January, 1880, there were twenty-one clear to fair and but ten cloudy days. Also in 1885 there were twenty clear to fair and only eleven cloudy. The number of cloudy days has been exceeded but once; this was in 1882, when there was a very large amount of precipitation, almost double the usual quantity, the cloudy days numbering 22. The month just closed had 1.08 inches less than the normal amount of precipitation—the total being 6.78 inches. More than half (3.66) of this amount fell on the 2d and 3d. Snow fell on six and rain on fifteen days. There were killing frosts on five days and solar halos on the 17th and 20th. The prevailing direction of the wind was northeast and total movement 4,819 miles."

Gadsden: "On the early morning of the 8th instant the thermometer registered 33°, by 2 p. m. of that day 17°, and early in the evening 10°, making the average for the day 20°. The following morning, the 9th, a little after daylight, it registered 2° below zero, and at 7 a. m. 4° below, where it remained until something after 9 a. m. At 1 p. m. it registered 6° above zero and remained at that until after 4 p. m.; early in the evening it registered 3° above; the average for the day was 2° above. On the morning of the 10th the thermometer registered 3° below zero, by 2 p. m. 14° above, and at night 8°, making the average for the day about 6° above. On the morning of the 11th, at daylight, the thermometer registered 3° below, and at 8 a. m. 7° below zero; it reached 8° above by 2 p. m. and dropped to 2° above at night, making the average for the day 0°. On the morning of the 12th 2° below zero was registered. The average for the four days was 7°.5 above. The average for the night of the 8th was 3° above; that of the 9th, 0°, of the 10th, 0°.5 above. I found the ground frozen twelve inches by measurement, and ice upon a pond, four and one-half inches thick. The coldest day of the winter previous to these was that of December 15, 1885, when the thermometer registered 15° in the morning and 20° at night, the average for the day being 23°. The coldest day of last winter was February 11th, when the thermometer registered 0° in the morning, 22° at noon, and 18° at night. The average for the day being 14°. The average for the four coldest days of last winter was 21°. The average for the coldest night of last winter was 8°.5 above. My thermometer may not register correctly, but the comparisons, at least, are correct. The charts sent me by the Signal Service office show that the cold wave tends very decidedly to deflect upon this portion of the state, caused no doubt by the conformation of the several ranges of mountains near us, so that it is usually colder at Gadsden than at many other places in the same latitude."

Mountain View: "On Friday morning the 8th, about 1 or 2 a. m. it commenced raining. The sky was without a cloud at 11 p. m., Thursday. The wind blew from the south. About 8.30 a. m. Friday the wind suddenly shifted to the west, and it snowed for half an hour, and commenced turning cold. The thermometer at 7 a. m. was 40°; at 2 p. m. it fell to 18°, and 9 p. m. it was 9° above zero. The wind blew very hard all the evening and that night. At 7 a. m. Saturday (9th) the thermometer was -6°. It was very cold all day. On Monday (11th) at 7 a. m. the thermometer registered -4°, and continued cold all day. Everything that contained moisture, and was not protected, was frozen. January has been an exceedingly rough month; a greater extreme than we have ever known in this country."

Prattville: "The cold wave predicted for the 7th reached us at 8.30 a. m. on the 8th, and within twenty-two hours the temperature fell from 46° to 6°. The wind, which was from the west, was often severe. Clouds shut out the sun, and fine snow driven by the wind added much to the rigor of the blast. Cattle, well fed, wrapped in bagging, and stalled, suffered very much. The leaves of bay trees, and green logs in the wood-yard eight inches thick had frozen water in their centres. Just before the cold wave came a dense mist from the southwest filled the atmosphere. Shortly after this wind began to rise and soon blew with considerable violence. The immense pond connected with the factories was covered with ice on the 13th one hundred yards from the shore and five inches thick. No one remembers to have seen this condition of the pond before."

Tusculum: "On the 8th throughout the entire day it was raining, snowing, and hailing. The 9th was very cold, registering -4°. Ice formed five inches in thickness. The 10th, 11th, and 12th were bitter cold days. Everything frozen."

State summary.

Mean temperature, 37°.9; highest temperature, 68°, at Mobile, on the 21st; lowest temperature, 7° below zero, at Gadsden and Chattanooga, on the 11th; range of temperature, 75°; greatest monthly range of temperature, 69°, at Mount View; least monthly range of temperature, 56°, at Eufaula; mean daily range of temperature, 12.6°; greatest daily range of temperature, 40°, at Tusculum, on the 8th; least daily range of temperature, 0°, at Centre, on the 3d; Fayette, on the 24th; and at Oswichee, on 5th.

Mean depth of rainfall, 6.63 inches; mean daily rainfall, 0.214 inch; greatest depth of monthly rainfall, 11.00 inches, at Newton; least depth of monthly rainfall, 3.17 inches, at Jacksonville; greatest daily rainfall average for state, 2.16 inches, on the 3d; greatest daily local rainfall, 4.57 inches, at Greensborough, on the 3d.

Average number of days on which rain fell, 7; average number of cloudy days, 17; average number of fair days, 6; average number of clear days, 8; warmest days, 1st, 2d, and 3d; coldest days, 8th, 9th, 10th, 11th, 12th.

Prevailing direction of wind, northwest.

The following is an extract from the January, 1886, "Weather Review of the Illinois Weather Service," under direction of

Mr. Charles F. Mills, of the Illinois Department of Agriculture, Springfield:

This "Review" contains a general summary of the conditions which prevailed over Illinois during the month of January, 1886, based upon the reports received from the Signal Service and voluntary observers reporting to the Illinois Department of Agriculture.

The state covers such an extended area from north to south (385 miles) that it has been found advisable to divide the same and follow the judicial divisions, which include the following territory, viz., the northern division extends from 42° 30' to about 40° 31'; the central division extends from about 40° 31' to about 39°; the southern division from about 39° to 36° 51'.

Atmospheric pressure.—The highest barometer reported at fourteen stations during the month of January was on the 11th, at six stations; on the 23d, at five stations; and on the 10th, 15th, and 19th, at one station each. The lowest barometer reported at fourteen stations during January, was on the 3d, at ten stations; on the 4th, at three stations; and on the 27th, at one station. The highest barometer reported in January during the past five years has been as follows: 1882, 30.780; 1883, 30.790; 1884, 30.850; 1885, 30.912; 1886, 30.700. The lowest barometer in January for the years named, was as follows: 1882, 28.930; 1883, 29.800; 1884, 29.070; 1885, 29.870; 1886, 29.000. The mean barometer of January for the same period was as follows: 1882, 30.074; 1883, 30.031; 1884, 30.133; 1885, 30.166; 1886, 30.009.

Temperature.—The mean temperature of January, 1886, was lower than the average of the corresponding month at all except four of the stations in the state from which observations have been received for a term of years. The mean temperature for the month was higher than the January average as noted at the following stations: At Aurora, Kane county, the average temperature for January, 1886, was 2° 43 higher than the average of the month in previous years; Prairieville, Lee county, 0° 60; Pana, Christian county, 0° 08; Centralia, Marion county, 0° 66. The temperature was below the January mean as noted at the following stations: At Marengo, McHenry county, the temperature for January, 1886, was 4° 90 below the mean of the corresponding month in previous years; Sycamore, DeKalb county, 0° 09; Chicago, Cook county, 2° 65; Davenport, Iowa, 6° 19; Peoria, 4° 33; Keokuk, Iowa, 9° 39; Springfield, 1° 87; Griggsville, Pike county, 1° 22; Mattoon, Coles county, 1° 25; Palestine, Crawford county, 0° 83; Greenville, Bond county, 0° 70; Saint Louis, Missouri, 3° 67; Swanwick, Perry county, 0° 81; McLeansborough, Hamilton county, 0° 70; Anna, Union county, 8° 14; Golconda, Pope county, 5° 51; Cairo, Alexander county, 9° 02. The average mean temperature of January for a term of twelve years has been 23° 35, which is 4° 87 higher than the mean for January, 1886. The mean temperature of January, 1876, 1877, 1878, 1879, 1880, 1882, and 1885 was higher than that of 1886, and lower in January, 1875, 1881, 1883, and 1884 than during the past month. The highest mean temperature for January during the past twelve years was 40° 84, in 1880, and the lowest mean of the month for the same period, 15° 45, in 1875.

The mean temperature of January during the past twelve years was: 1875, 15° 45; 1876, 33° 37; 1877, 21° 45; 1878, 29° 75; 1879, 21° 89; 1880, 40° 84; 1881, 15° 94; 1882, 28° 38; 1883, 17° 61; 1884, 18° 42; 1885, 18° 62; 1886, 18° 48; average for twelve years, 23° 35.

The highest temperature in January, 1886, was reported on the 3d at twenty-nine stations; on the 10th at ten stations; on the 2d at nine stations, and on the 5th at one station; in the northern division of the state the highest temperature was reported on the 3d at ten stations; on the 2d at five stations, and on the 1st at one station. In the central division of the state the highest temperature during the month was reported on the 3d at nine stations; on the 1st at four stations; on the 2d at two stations, and on the 5th at one station. In the southern division of the state the highest temperature in January was reported on the 3d at ten stations; on the 1st at five stations, and on the 2d at two stations; the lowest temperature in January, 1886, was reported on the 9th at fifteen stations, on the 10th at fourteen stations, on the 11th at nine stations, on the 23d at eight stations, and on the 12th and 22d at one station each; in the northern division of the state, the lowest temperature was reported on the 23d at eight stations, on the 10th at six stations and on the 22d at one station; in the central division of the state, the lowest temperature was reported at seven stations on the 9th, and same number stations on the 10th and on the 11th and 12th at one station each; in the southern division of the state, the lowest temperature was reported on the 9th at eight stations, on the 11th at eight stations, and on the 10th at one station; the highest temperature noted in January, 1886, was 61° 00, at Eberle, Effingham county, and the lowest, —26° 00, on the 23d, at Marengo, McHenry county; the highest temperature noted in January for a term of years has been as follows: 1882, 68° 00; 1883, 56° 00; 1884, 80° 00; 1885, 64° 00; and 1886, 61° 00. The lowest temperature noted for the same months during the years named was as follows: 1882, —12° 00; 1883, —34° 00; 1884, —33° 00; 1885, —32° 00; and 1886, —26° 00. The mean temperature of the state for the month of January during the past five years has been as follows: 1882, 28° 97; 1883, 17° 60; 1884, 18° 42; 1885, 18° 31; 1886, 18° 48.

Precipitation.—The precipitation in January, 1886, including melted snow, averaged 3.04 inches at the forty-two stations represented in this report, and exceeds the average rainfall for January during the past twelve years by 0.75 of an inch. The average rainfall of January, 1886, was exceeded by the precipitation of the corresponding month in 1876 of 5.17 inches, and in 1880, of 3.86 inches. The rainfall was quite general over the state on the 2d, 3d, 4th, 8th, 15th, 18th, 20th, 27th, and 30th of January. There was no rain reported in any portion of the state January 11th and 24th. The average precipitation at the stations from which reports were received for January was less than

the average for the month at seven stations and greater at seventeen stations. No comparison is made for the remaining nineteen stations established during the year. The precipitation in January, 1886, was less than the average rainfall for the same month in previous years as noted at the following stations, viz., Davenport, Iowa, 0.48 of an inch less; Peoria, 0.78; Pana, Christian county, 0.46; Greenville, Bond county, 0.31; Anna, Union county, 0.50; Golconda, Pope county, 0.58; Cairo, 0.34. The January, 1886, precipitation exceeded the average of the month as noted at the following stations, viz., Marengo, McHenry county, 1.78 inches more than the average; Sycamore, DeKalb county, 1.82; Chicago, 1.53; Aurora, Kane county, 1.14; Prairieville, Lee county, 1.89; Keokuk, Iowa, 0.44; Springfield, 0.12; Griggsville, Pike county, 0.54; Mattoon, Coles county, 0.97; Palestine, Crawford county, 0.35; Collinsville, Madison county, 1.32; Centralia, Marion county, 1.90; Saint Louis, Missouri, 0.89; Mascoutah, Saint Clair county, 1.29; Swanwick, Perry county, 0.68; McLeansborough, Hamilton county, 0.51. The least precipitation at any station in January, 1886, was 1.68 inches at Pana, Christian county. The greatest rainfall during the month was 5.01 inches at Sumner, Lawrence county.

The average monthly precipitation for all the stations from which January observations have been received during the past twelve years was: 1875, 1.14; 1876, 5.17; 1877, 1.42; 1878, 1.46; 1879, 1.61; 1880, 3.86; 1881, 1.49; 1882, 2.41; 1883, 1.87; 1884, 1.21; 1885, 2.84; 1886, 3.04; average for the twelve years, 2.29.

Remarks.—The science of meteorology is deservedly receiving more attention each succeeding year, especially at the hands of the more intelligent farmers who realize the great practical value of information of this character to all engaged in agricultural pursuits.

The department desires to secure the assistance of an observer for each county in the state. There are, doubtless, parties in the counties not represented in this report by observers, who are giving attention to the science of meteorology. The attention of all interested in having the meteorological history of each county in the state preserved in the "Monthly Weather Review" of the department is invited to the importance of this work and an earnest invitation is extended to all to aid in completing the meteorological records of the state.

The following meteorological summary and accompanying remarks are from the January, 1886, report of the "Indiana Weather Service," under direction of Prof. W. H. Ragan, of De Pauw University, Greencastle:

Districts.	Temperature.			Average precipitation.
	Highest.	Lowest.	Monthly means.	
Northern counties.....	55.0	—20.0	19.9	3.68
Central counties.....	55.0	—24.0	21.6	3.49
Southern counties.....	60.0	—25.0	24.4	3.91
State.....	60.0	—25.0	22.0	3.36

The cold wave of the 9-13th in some particulars was the most remarkable known for years. This was true as regards its widespread distribution in the southern portions of the United States. The weather records of Florida show that they have had no such unusually low temperature since 1835. The zero line dropped down into Texas, and extended through the cotton states to Georgia, while the frost line extended far into the Gulf of Mexico, including all of Florida. The wave passed down from Manitoba, over the western plains to Texas and Louisiana, gradually diminishing in severity as it spread eastward. It did not strike us with the sudden violence of that of January 1, 1864, nor did the temperature fall so low as on January 5, 1884, but, like each of those noted storms, was borne to us by west or southwest winds. This storm is therefore noted, not so much for its intense severity in Indiana as for its having penetrated the extreme south, as it did. By reference to the Signal Service daily weather maps for the period covered by this storm, we are led to the conclusion that such phenomena are due to the location, energy, and movement of an area of high barometer and cold wave in the Northwest and a low barometer that precedes the cold wave, coincident in time as to formation and movement. If the low is located well south, as was true of the depression that preceded this cold wave, and if it possesses unusual energy, it is quite probable that we will have a widespread distribution of the storm, or, at least, that the cold wave will penetrate as far south as the line of movement eastward of the centre of the low barometer. On the other hand, if the low pressure area is high up, say crossing through Indiana or northward, while it may be intensely cold in Minnesota and Dakota, it will, most probably, not extend to the Gulf States. An illustration of this may be found in the succeeding cold wave of the 21st-23d, when the temperature at Saint Paul was really lower than during the storm under consideration, yet it did not fall below 50° in Florida.

Temperature.—The average of the 1st, 2d, 3d, 15th, 25th, 26th, 27th was above freezing, and of the 9th, 10th, 11th below zero at Indianapolis. The 3d was the warmest and the 10th the coldest. The 10th was a little colder than the coldest day of last winter (—10° 9, mean; —4° 9, highest; —15° 2, lowest; against —10° 8; +6° 6; —13° 1, February 10th) at Greencastle. The average for the month was 3° 1 below the normal at Logansport; 3° 7 below at Spiceland; 6° 4 below at Indianapolis; 2° 1 above at Connersville; 1° 8

below at Mauzy; 1° above at Sunman; 0° above at Columbus; 0° above at Worthington; 4° below at Vevay; 3° below at Blue Lick; 0° above at De-gonia Springs; and for the state, 1° lower than in 1883; 1° higher than in 1884; 1° higher than in 1885; 0° above normal. The highest station mean was 27° 3, at Vevay; lowest, 16° 4, at Monticello; highest maximum, 60°, at Butlerville and Vevay; lowest minimum (singularly enough), -25°, at Butlerville; state range, 85°; average station range, 72° 0; greatest, 85°; least, 67°. The highest occurred at all stations on the 3d, and the lowest at all central and southern stations on the 10th, 11th, 12th, and at some northern stations on the 23d. It is probable the air was coldest on the 10th in that group of cold days, and the lower temperatures of the 11th and 12th were recorded from thermometers exposed to uninterrupted radiation in calmer, clear weather. In the north the lowest temperatures were probably not reached during the first severe cold wave because of the proximity of the lakes.

Temperature of well water on the 31st, with depth of water in feet—Greencastle 46°, 13; Connersville, 39°, 6; Salem, 49°, 14; Princeton, 49°, 14.

Precipitation (inches).—The precipitation was well distributed through the month and over the state, ranging from 28.78, on the 15th, to none, on the 6th, 7th, 14th, 17th, 24th, 26th, and from 5.71, at Marengo, to 1.33, at Monticello. The snowfall ranged from 18.6, at North Liberty, to 4.1, at Blue Lick, quite a number of stations not reporting. Principal rains fell on the 2d (17.49), 3d (10.68), 15th (28.78), 20th (8.12), 27th (6.30), and snows on the 4th, 5th, 8th, 9th, 16th, 18th, 29th, 30th, 31st. The principal rains all fell in connection with pronounced low barometric areas. Precipitation fell on twenty-five days in some portion of the state. Snow fell on sixteen days in the north, twenty in centre, sixteen in south, twenty-one in the state. Thunder-storm at Marengo, on the 2d. Total precipitation was 0.29 above normal at Logansport; 0.85 above at Spiceland; 1.01 above at Indianapolis; 0.39 above at Connersville; 1.09 above at Mauzy; 0.46 above at Sunman; 0.58 above at Columbus; 1.73 below at Worthington; 0.48 below at Vevay; 0.22 below at Blue Lick; for the state, precipitation 0.99 above 1883; 1.67 above 1884; 0.32 below 1885; 0.59 above normal; snowfall 3.8 below 1884; 3.7 below 1885; 2.5 below normal.

Year, January—warmest, coldest; greatest precipitation, least; greatest snowfall, least.—Logansport (43° 0), 1880, (10° 5), 1875; (4° 70), 1870, (0° 24), 1857; (35° 4), 1873, (0° 2), 1876; Spiceland, 1880, 1857; 1876, 1884; 1867, 1876; Indianapolis (45° 9) 1880, (20° 0) 1875; (6° 32) 1880, (1° 01) 1875; —, Vevay, 1880, 1884; 1876, 1879; 1865, 1876. This January has exhibited no extreme in any element in this state. The most remarkable general feature is set forth in the opening. The cloudiness and number of days on which there was precipitation were probably very greatly in excess of normal.

The following meteorological summary and accompanying remarks are from the January, 1886, report of the "Indiana Weather Service," under direction of Prof. H. A. Huston, of Purdue University, Lafayette:

Districts.	Temperature.			Average precipitation.
	Highest.	Lowest.	Monthly mean.	
Northern counties	56.0	-18.0	19.39	2.58
Central counties	55.0	-24.0	21.81	3.47
Southern counties	60.0	-23.0	24.53	3.57
State	60.0	-24.0	21.91	3.21

The mean temperature of the state for January, 1886, was 0° 9 above that for the past three Januaries; 6° 64 below the mean of fifteen years at Indianapolis; 4° 33 below the mean of thirty-one years at Logansport; 9° 49 below the mean of twenty-one years at Vevay; 3° 68 below the mean of thirty-two years at Spiceland; 0° 91 above the mean of six years at Mauzy; 6° 24 below the mean of eight years at Blue Lick; 0° 65 below the mean of four years at Worthington; and 1° 28 below the mean of seven years at this station. The mean temperatures at the various stations were, with one exception, below the normal, the amounts ranging from 1° 8 to 6° 4. The highest temperatures were reported on the 3d; the lowest from the 10th to the 12th. The cold wave of this period was general throughout the state, while that of the 23d was much more marked in the northern counties.

The mean precipitation for the state was 0.26 inch above that for the past three Januaries; 0.3 inch above the mean of fifteen years at Indianapolis; 1.17 inches above the mean of twenty-six years at Logansport; 0.89 inch above the mean of twenty-one years at Vevay; 0.32 inch above the mean of twenty-six years at Spiceland; 0.03 inch above the mean of six years at Mauzy; 0.12 inch below the mean of five years at Blue Lick; 0.77 inch above the mean of four years at Worthington; and 0.82 inch above the mean of seven years at this station. At southern stations the precipitation was below the normal, at central and northern stations it was above the normal. The snowfall was normal.

Eight stations reported lunar halos on the 14th and one on the 16th, 17th, and 18th. Four solar halos and one solar corona were reported.

The following is an extract from the January, 1886, report of the "Minnesota Weather Service," under direction of Prof. Wm. W. Payne, Carleton College, Northfield:

The average mean temperature for January, in direct contrast with the preceding month, and as during the three preceding Januaries of 1885, 1883, and

1882, has been much below the average temperature throughout the state. The warmest part of the state has been in the vicinity of Lake Superior and the lower altitudes in the vicinity of the Mississippi River, where the average has been from 2° to 12° above zero; in all other sections the mean varied from -0° 1 to -11° 2, the average for the state being 0° 9 above zero. At many stations the highest temperatures for the month were below the freezing point. The maximum temperature, 38° 0, was noted at Grand Forks, on the 13th, and the minimum temperature, -41° 5, at Park Rapids, on the 23d.

The warmer periods lasted from the 1st to the 6th and from the 24th to the 31st. There were also two well-defined cold periods, the first lasting from the 7th to the 12th, and the second from the 17th to the 24th. The 8th, 9th, and 10th, and 16th, 20th, and 22d were severely cold days, the average being many degrees below zero. The large monthly movement of 12,800 miles of wind occurred at Bird Island. Gales were frequent, and sometimes severe, in the western part of the state. The average direction of the wind was, as usual for a winter month, from the northwest.

Precipitation.—The precipitation during the month has been nearly all in the form of snow, and in very variable quantities in the several sections of the state. In the southeastern part, south of a line drawn from Saint Paul to Sherburne, there has been from two to five times the average amount. In the central-western part from one-half to two-thirds less than usual, and in the north and northwest about the usual amount. At Winona there were nineteen, Red Wing sixteen, Northfield sixteen, Mankato fourteen, and Albert Lea twelve days on which snow fell in measurable quantities. Large amounts, in inches, for the month were noted as follows: Duluth, 22; Red Wing, 52; Northfield, 38.8; Winona, 56.0; Mankato, 35.4; and Spring Valley, 44 inches. The greater amount of this snow was precipitated on the 2d, 3d, and 4th, during which time the southeastern part of the state was within the influence of a vapor-laden cyclone, which advanced from southern Texas and the Gulf of Mexico during the 1st and 2d, and was central at La Crosse at 7 a. m. of the 3d, causing brisk gales and heavy snow for three days which, however, did not extend west of Saint Cloud and Bird Island. At the end of the month there were from two to five inches of snow on the ground in the central-western part of the state, and from ten to twenty inches in the northern and northwestern sections. The deep snow, by drifting and filling the cuts, has, at times, seriously interfered with traffic on the railways south of Saint Paul, but north and west of that point has not been in sufficient quantities to more than slightly delay the movement of trains. The ground in the logging districts, which was nearly or quite bare at the beginning of the month, is now covered with from one to two feet of snow, and prospects are good for a full average cut of logs for the next season's supply.

Grand Forks: 1st, two very bright parhelia visible from 2 p. m. until sunset; clear sky and light haze. 2d, 9 p. m., a faint light in the north, a few auroral beams visible at 9.35 p. m. of a pale whitish color; altitude, 20°; azimuth, 10°; visible about five minutes. 4th, 11.30 a. m., two parhelia, obscured by a thick, whitish haze, were visible at intervals until after 3 p. m. 6th, 2 p. m., cold northwest blizzard and continued until 5 p. m. of 8th; maximum velocity of wind, twenty-eight miles; trains from south two to three hours late. 9th, 9.30 p. m., auroral display, consisting of two bright arches with a dark cloud beneath; arches crossed the heavens from northwest to southeast, and remaining stationary; altitudes about 25° and 30°; at 10 p. m. a few streamers shot upwards of the arches, being of a few minutes' duration; the display continued until after midnight. 11th, a brilliant sunset display, the sky remaining very red long after sundown. 13th, sky very red before sunrise, and the sun a very bright white color. 15th, 10.32 a. m., two parhelia visible, nearly obscured by a thick haze. 16th, 6.35 p. m., a large lunar halo, visible until 9.50 p. m.; 16th, 9.30 a. m., two parhelia visible, nearly obscured by a haze. 18th, 3.20 p. m., two parhelia of bright white and red tint; cloudy; 18th, 6.15 p. m., two parhelia slightly obscured by a haze and visible until 7.20 p. m.; at 8.00 p. m. two large lunar halos. 19th, 9.40 p. m., a large lunar halo visible; was obscured by a haze at 9.45 p. m. 20th, 9.20 a. m., two parhelia visible, light haze, .5 cloudy. 21st, a cold north blizzard from 9 a. m. until 10 p. m.; maximum velocity, twenty-eight miles; 8.30 p. m., a large lunar halo, being visible but a few seconds, completely obscured by a thick haze. 22d, 2.20 p. m., two parhelia visible; color, bright white and pink tint; clear sky. 27th, a brilliant sunrise display and sky remarkably red; at 2 p. m., a gale from the south; maximum velocity at 9 p. m., thirty-three miles; a blizzard from northwest raging all night, and continued until 4 p. m. of 28th; maximum velocity, twenty-eight miles.

Sherburne, 2d, 7 a. m., snowfall in night about three-fourths inch; 2 p. m., a thick haze around the sun; 6 p. m., commenced to snow; 9 p. m., still snowing, with heavy north wind. 3d, 7 a. m., snow storm; 2 p. m., wind blowing a gale and snow storm; 9 p. m., heavy wind and snow storm. 4th, 7 a. m., high wind and snow storm. 10th, 9 p. m., two bright lunar parhelia north and south of moon; high wind. 14th, 6 p. m., commenced to snow; 9 p. m., snowing very little. 15th, snow storm in the night; 7 a. m., snowing very little; snowfall between two and three inches; 2 p. m., stormy. 21st, a deep red sunrise; 10.30 a. m., wind blowing a gale; 2 p. m., snow flying; wind blowing a gale. 25th, a sleet storm in night; 4.30 p. m., a thick haze around the sun. 30th, snow storm in night about one-half inch deep; 10 a. m., snow storm; 2 p. m., snowing a very little. 31st, 8.30 a. m., snow storm.

Morris: 17th, halo 20° in diameter, east edge passing through the moon. Wadena: 21st, six inches of snow on the ground and sleighing good; weather clear and pleasant during month, with few stormy days; snow drifted but slightly.

Red Wing: the heaviest snow storm ever known in Red Wing began at 6.30 p. m. of the 2d, and continued until 4 p. m. of the 4th. Total snowfall 30 inches.

Spring Valley: 9th, a very fine meteor passed over the village from west to east, for a moment bright as the sun at noonday.

Albert Lea: coldest day, Friday, 22d; average, $-27^{\circ}.8$. Ice in lakes twenty-four inches thick. Amount of snowfall largest known in any one month in many years.

The following is an extract from the January, 1886, report of the "Missouri Weather Service," under direction of Prof. Francis E. Nipher, Washington University, Saint Louis:

The month of January, 1886, has been uniformly cold, with a marked excess of precipitation, almost all of which has fallen as snow. The average temperature was $22^{\circ}.1$ at the central station, which has been exceeded in coldness but three times since 1837; this was in the years 1856, 1857, and 1875, the coldest having been $19^{\circ}.3$, in 1857.

The last four Januarys have been unusually cold. Their means have been $24^{\circ}.6$, $22^{\circ}.8$, $22^{\circ}.5$, and $22^{\circ}.1$, each one being thus colder than the preceding one. The normal January temperature is $31^{\circ}.8$. The coldest minimum temperature reached during the month was $-14^{\circ}.2$, on the 9th. The highest maximum was 57° , on the 2d. A marked feature of the month was the high winds which accompanied the coldest weather. The temperature fell below zero Fahr. on twenty-eight days, or on every day after the 3d. On one day it did not rise above zero, -2° being the maximum, and on sixteen days it did not rise above 32° Fahr. The precipitation was quite uniformly distributed throughout the month. During the last half of the month the ground was entirely covered with snow, with little or no thawing during the day.

In the state the lowest minimum temperature reported was -24° , at Oregon; Kirksville and Sedalia reporting -22° . The highest minimum was reported from the signal office at Cairo, Illinois, viz., -6° . The minimum reported by the signal office at Saint Louis, $-8^{\circ}.2$, is evidently affected by local influences.

The rainfall (melted snow) in the state has been from one to two inches in the extreme north, and also south of a line drawn diagonally across the state from northwest to southeast, a belt of this area extending into Illinois in the vicinity of Saint Genevieve. The maximum fall, 3.5 inches, occurred at Saint Charles and Saint Louis.

Chamois reports the coldest January for thirteen years, and that the temperature was 7° below the average January of that period. The rainfall was three inches, most of which is yet on the ground as snow and ice.

Houstonia reports parhelia on the 11th and 16th, solar halo of 22° with upper contact arch, on the 8th, while on the 9th halos of 22° and 46° with upper contact arches were visible. Four inches of snow on the ground at the end of the month.

Houstonia also reports the temperature of the McAlister Springs as follows: Salt Gum, 60° ; Black Sulphur, 59° ; White Sulphur, $52^{\circ}.5$. The external temperature was 38° .

Glasgow reports solar halos on the 7th, 8th, and 22d.

Mexico reports eight inches of snow on the ground at the close of the month, and Ironton reports eight and one-half inches.

At Oregon the total snowfall of the month was 21.3 inches, ten inches being on the ground at the end of the month. A good winter for wheat. Rainfall and snow exceeds that of any January since 1861, and any preceding that since 1855.

The following is an extract from the January, 1886, report of the "Nebraska Weather Service," under direction of Prof. Goodwin D. Swezey, of Doane College, Crete:

The month opened with a storm of considerable energy in Texas, which moved in a northeasterly direction, accompanied by heavy snow in this region. This storm was very widespread and disappeared in the Saint Lawrence Valley on the 4th.

The severest storm of the month developed in western Kansas during the afternoon of the 6th. At the time of its formation a cold wave made its appearance north of Montana. The storm at first was a weak depression, and was pressed southward by the area of high pressure till it reached the Texas coast on the 7th. Cold-wave flags were ordered up in eastern Nebraska on the afternoon of the 6th; this was a genuine "norther," wind blowing that night from the north-northwest at from forty to fifty miles an hour at Crete; the temperature fell thirty-nine degrees in twenty-four hours. The cold wave moved with great rapidity southward, causing a severe "norther" in Texas, with intense cold weather, which was destructive to animal life and the sugarcane in the sugar-growing regions of Texas and Louisiana. The storm, continuing its northeasterly movement, was central over the Chesapeake Bay at midnight of the 8th, and was last observed on the 10th over the Gulf of Saint Lawrence. The lowest temperature of the month was on the 8th, during the passage of the cold wave.

On the 14th another storm made its appearance in Texas, moved northeasterly to the Lake region, and was followed by a cold wave, for which flags were ordered up here, and which were justified by a fall of twenty-two degrees. The next considerable storm was on the 18th; it was also followed by a cold wave. On the 22d a cold wave made its appearance in the Northwest and gradually overspread all districts; and a fourth cold wave, with a fall of thirty-one degrees, came on the last day of the month.

On the whole, the month has been a marked month, with the most continued cold weather for many years; the cold has not been extreme, the minimum for the month not being as low as for the past three Januarys, but the mean temperature for the month has been far lower than ever before since our observa-

tions began. In the middle and western sections of the state the temperature has been considerably higher and on the Pacific coast it was about as high as usual. The month has also been most remarkable in the amount of snow, being nearly double that of any preceding January and nearly four times the normal amount for January. The number of days of snowfall and the number of cloudy days have been correspondingly large.

Precipitation.—The average rain for the different sections of the state for January, 1886, is as follows:

	Inches.
Northeast section (one station).....	0.44
North middle (no station).....	
West (one station).....	0.55
South middle (two stations).....	0.70
Southeast (covering essentially what has heretofore been the "whole state") as far as reporting.....	2.04

State average by sections 0.93

Weather signals.—The weather indications for eastern Nebraska, as forecast by the Signal Service at Washington, are now telegraphed daily to the central office at Crete, and signals are displayed from the college building to indicate the weather of the next twenty-four hours. Towns, or private parties in towns, who will pay for the telegrams may have cold wave and other warnings sent them from this office, and may be able to confer substantial benefits upon the community by displaying signals.

The following is an extract from the January, 1886, "Bulletin of the New England Meteorological Society," under direction of Prof. Winslow Upton, Providence, Rhode Island:

Summary for January, 1886.

Reports for the month were received from one hundred and thirty-three observers.

General Conditions.—The meteorological conditions of the month may be briefly enumerated in eight divisions: first, 1st-3d; fair and warm, the barometric depression of December 31st having been succeeded by an area of high pressure. Second, 4-6th; cloudy and warm, with heavy rains attending a depression which passed easterly on the 5th over lower Canada. Third, 7-8th; succeeding cold wave, but pressure still below the normal. Fourth, 9-10th; violent and destructive snow storm, adepression (pressure 28.7) passing from Rhode Island northerly across eastern Massachusetts and western Maine. Fifth, 11-16th; succeeding cold wave with very high pressure (30.8). Sixth, 17th-22d; cloudy, with snow and rain, and short intervals of clear weather attending three depressions which moved easterly in lower Canada on the 17th, 19th, and 21st, respectively. Seventh, 23d; succeeding cold wave and high pressure (30.6). Eighth, 24th-31st; a week of cloudy weather, with temperature near freezing, frequent snow, rain, and sleet, a barometric depression prevailing in the Southern States on the first three days, and later advancing northeasterly in the Atlantic Ocean. The general character of the month was therefore stormy, with a large amount of rain and snow, several severe cold waves, great ranges of barometric pressure, and six cyclonic depressions, one of which passed directly over the district.

Special Features.—The following deserve prominent mention:

1. *The heavy rains of the 3d-5th:* The amounts reported average between one and two inches, 2.50 inches having been recorded in Connecticut. The high temperature added to the rainfall caused the ice to break up in the rivers, and very disastrous freshets occurred, especially in Maine, New Hampshire, and Connecticut.

2. *The storm of the 9th and 10th:* This is one of the most severe on record. Entering the Gulf States on the 7th (pressure 29.5) it moved northeasterly with a velocity of about thirty-five miles per hour, increasing in intensity as it advanced. Its centre (pressure 28.7) passed nearly over Providence, Boston, and Portland on the 9th. The barometric gradient, 30.8 in the northwest to 28.7 at the storm-centre, caused winds reaching sixty miles an hour. The temperature was far below the normal, and the snowfall varied from 2.5 to 18 inches, the latter recorded at Beverly. The snow, though light, was densely packed as it was drifted by the wind, and the average of sections taken at seventeen stations shows that one inch of snow was the equivalent of about 0.15 inch of rain.

The barometric registers at Blue Hill and Providence show great oscillations in pressure during its fall, at least three waves of depression having been noted in twelve hours; and the thermometric registers at Providence and Chestnut Hill show a fall of temperature of 15° in the two hours immediately preceding the passage of the centre and a similar rise after its passage. The peculiar characteristics of the storm were the extreme rapidity of the fall in pressure, coupled with its low value at the minimum, which has been surpassed in but few instances on record, and the sudden increase in the violence of the wind from a light wind to a severe gale. The record of disaster to shipping is a long one.

3. *Cold waves and high pressure:* There were three periods of excessive cold, on the 8th and 9th, 12th and 13th, and 23d and 24th, respectively. The second of these was the most severe; at the time of the storm of the 9th, temperatures of -50° prevailed in the extreme northwest. The cold area reached New England on the 12th, the temperatures ranging from -30° to -40° in exposed regions. The barometric pressure exceeded 30.8 inches, the highest reported having been 30.90, at Albany.

4. *The ice storm of the 28th and 29th:* The prevalence of snow, rain, and sleet, beginning on the 24th, culminated in a fall of rain and sleet on the

above dates, which adhered to trees, telegraph wires, and other objects, forming an ice coating from one-half to one and one-half inches thick. This was especially severe along the coast, and great damage was done to trees by the breaking of limbs.

Earthquakes.—A light earthquake was felt on the 5th instant, about 7.10 p. m., over a small area about Merrimac, between Manchester and Nashua, New Hampshire.

A second light earthquake was felt in southern New Hampshire and the adjacent part of Massachusetts about 5.15 p. m., Sunday afternoon, 17th instant; where most distinct, it set furniture and dishes rattling and was accompanied by a noise described by many persons as resembling that made by a wagon on frozen ground. Its area as determined by about sixty reports, of which thirty-six were furnished by Mr. C. H. Webster, of Nashua, New Hampshire, is bounded, approximately, by Haverhill, Lowell, and Fitchburg, Massachusetts, on the south; and by Candia, Manchester, Contoocook, and Warner, New Hampshire, on the north. The disturbance was therefore felt over a surface of about fifteen hundred square miles.

Miscellaneous.—Auroras were reported on the 1st and 8th at Kent's Hill and Mount Washington; 2d, at Walpole and Chelsea; 14th, at Cambridge.

Thunder was noted at Provincetown on the 5th, 7.00–7.30 a. m.

Solar halos of unusual brilliancy were recorded by many observers on the 24th.

The snow on the ground at the close of the month was 6 to 20 inches in depth.

The verification of the daily weather indications displayed by local flag signals, made at eleven stations, gives an average percentage of 86 for temperature and 80 for weather.

Prof. B. F. Thomas, of the Ohio State University, Columbus, director of the "Ohio Meteorological Bureau," forwards the following state summary and table of comparisons for January, 1883 to 1886, in advance of the regular monthly report:

	1883.	Date.	1884.	Date.	1885.	Date.	1886.	Date.	Average for past 4 years.
Mean barometer, inches.....	30.18	...	30.20	...	30.16	...	30.08	...	30.16
Highest barometer, inches.....	30.74	22	30.83	26	30.78	2	30.77	14	30.83
Lowest barometer, inches.....	29.50	20	29.48	2	29.12	6	29.11	9	29.11
Range of barometer, inches.....	1.24	...	1.35	...	1.66	...	1.66	...	1.72
Mean relative humidity.....	81.6	...	82.6	...	82.0	...	83.8	...	82.5
Mean temperature.....	34.1	...	19.4	...	22.6	...	23.9	...	22.5
Highest temperature.....	61.0	30	59.7	30	76.0	9	61.0	3	76.0
Lowest temperature.....	-17.5	22	-34.0	25	-31.0	29	-19.0	12	-34.0
Range of temperature.....	78.5	...	93.7	...	107.0	...	80.0	...	110.0
Mean daily range of temperature.....	16.7	...	18.9	...	18.1	...	16.0	...	17.4
Greatest daily range of temperature.....	45.8	21	48.0	25	58.5	30	44.5	14	58.5
Least daily range of temperature.....	1.8	28	2.1	1	1.2	7	12.0	26, 28	1.2
Average number clear days.....	3.7	...	6.4	...	8	...	3.3	...	5.3
Average number fair days.....	10.3	...	8.2	...	11	...	8.5	...	9.5
Average number cloudy days.....	17.0	...	16.4	...	12	...	19.2	...	16.2
Number days on which rain fell.....	15.6	...	14	...	13.9	...	16.1	...	14.9
Mean rainfall, inches.....	2.45	...	2.72	...	4.16	...	3.49	...	3.21
Average daily rainfall, inches.....	0.08	...	0.09	...	0.13	...	0.11	...	0.10
Greatest rainfall, inches.....	4.04	...	5.61	...	6.73	...	65.72	...	66.73
Least rainfall, inches.....	0.75	...	0.55	...	1.42	...	1.76	...	0.75
Prevailing direction of wind.....	sw.	...	sw.	...	sw.	...	w.	...	sw.

a At Quaker City; b at Sidney; c at Marietta; d at Cleveland; e at Pomeroy; f at Oberlin; g at Granville; h at Troy; i at New Bremen; j at Hanging Rock; k at Logan.

Table of verification of weather signals.

Name of station.	Temperature.	State of weather.
	Per cent.	Per cent.
McConnelsville.....	86	97
Hillsborough.....	93	89
Athens.....	92	80
Wauseon.....	94	90
Hamilton.....	70	86
For all stations.....	89	89

The following is an extract from the Tennessee "State Board of Health Bulletin," for January, 1886, prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health. The summary is prepared by Major H. C. Bate, in charge of the State Meteorological Service:

The month of January was characterized by the abnormally low temperature about the 9–12th, with the attendant snowfall and high winds, and the large proportion of cloudiness.

The mean temperature was 30°.47, 3°.11 below the mean for January, 1885, and 1°.02 above that for January, 1884. The maximum temperature was 61°, recorded about the 26th, and was 8° below the maximum of January, 1885, and 13° below the maximum of January, 1884. The minimum temperature, recorded about the 11th, was 23° below zero, reported at Sunbright, Morgan county, 18° below the minimum recorded in January, 1885, and 7° below that

recorded in January, 1884; this was the lowest point reached in the state for a great many years.

The mean precipitation for the month was 5.06 inches, 1.90 inches less than the precipitation for the corresponding period last year, and 1.49 inches less than that for the corresponding period of 1884. Of this amount, the eastern division received an average of over five inches, the middle division received an average of a little less than five inches, while the western division received over 5.5 inches. The greatest precipitation occurred on the 2d, 3d, 8th, 15th, and 23d. That of the 2d, which was the greatest, and the 15th, was exclusively rainfall, while that of the 8th and 23d was partly rain and partly snow and sleet. The greatest local daily rainfall occurred on the 2d, at Bolivar, and was three inches. The above rains were all general. From the 18th to the 31st, inclusive, were general rains and snows, but mostly light, excepting that of the 23d. There were only two days during the month free from precipitation—the 11th and 17th.

There were several snowfalls during the month, the greatest being on the 8th and 9th. The mean depth that fell was 5.77 inches.

At Paris the observer reports fifteen days on which the sun was not seen.

The observer at Grief reports the Alleghany Mountains covered with snow almost to their base at the close of the month; no snow in the lowlands.

The observer at Parksville reports the Oconee River frozen over on the 10th; the ice six inches thick on the 13th, and the ice breaking up on the 16th.

The observer at Riddleton reports ice eight to twelve inches thick from the 10th to the 16th; it disappeared on the 17th.

During the month, through the kindness of Gen. W. B. Hazen, Chief Signal Officer, ten stations were established in the state for the purpose of receiving the daily weather indications and displaying them by signal flags. These stations were located as follows: Jackson, Milan, Trenton, Clarksville, Gallatin, New Middleton, Murfreesborough, Shelbyville, Fayetteville, and Athens. From the reports from these stations it seems that the percentage of verifications from the time the stations were established to the close of the month was for temperature about 85 per cent., and for weather about 77 per cent. Some of the stations reported 100 per cent. of verifications of temperature. During the month the percentages of verifications of the predictions according to the signals displayed daily from the signal office in Nashville were for temperature 93.5 per cent., and weather 87.1 per cent.

It is gratifying to know that the display of the weather predictions by signal flags at the various stations has already proved of great benefit to the farmers and others in the vicinity of the stations, and it is to be hoped that these benefits will be further extended by the establishment of additional stations in the near future.

State summary.

Mean temperature, 30°.47; highest temperature, 61°, on the 26th, at Knoxville; lowest temperature, -23°, on the 11th, at Sunbright; range of temperature, 84°; mean monthly range of temperature, 68°.21; greatest monthly range of temperature, 80°, at Greeneville; least monthly range of temperature, 61°, at Parksville; mean daily range of temperature, 12°.74; greatest daily range of temperature, 44°, on the 13th, at Fostoria; least daily range of temperature, 1°, on the 5th, at Careyville, Riddleton, and Trenton; mean of maximum temperatures, 58°.27; mean of minimum temperatures, -10°.74.

Mean depth of rainfall, 5.06 inches; mean daily rainfall, 0.163 inch; greatest rainfall, 8.90 inches, at Fostoria; least rainfall, 1.22 inches, at Warner; greatest local daily rainfall, 3.00 inches, on the 2d, at Bolivar; days of greatest rainfall, 2d, 3d, 8th, 15th, 23d; day of greatest rainfall, 2d.

Average number of days on which rain or snow fell, 14; average number of clear days, 5; average number of fair days, 7; average number of cloudy days, 19.

Mean depth of snowfall, 5.77 inches; greatest depth of snowfall, 16.50 inches, at Clementsville; least depth of snowfall, 0.60 inch, at Chattanooga.

Days without precipitation, 11th, 17th.

Warmest days, 1st, 2d, 3d, 26th; coldest days, 9th, 11th, 12th.

Prevailing wind, northwest.

The following is an extract from a meteorological record for the winter months of 1835, and 1851 to 1857, also a table showing the comparison between the temperature for January, 1857 and 1886, furnished by Dr. W. W. Anderson, voluntary observer at Stateburg, South Carolina:

1835.—February 8th: the thermometer at sunrise was 2° below zero; this was the coldest day ever known in South Carolina and the southern country generally; pomegranate and fig trees were killed, as were also nearly all of the Pride of India trees, even the oldest shared the same fate; all orange trees as far south as Florida were killed; the ground froze a foot deep, and continued frozen for more than a week before it began to thaw.

1851.—December 17th: the thermometer in the open air at sunrise was 16°; on the 18th it was 14°, and on the morning of the 19th it was 22°; ice from three to four inches thick formed on ponds.

1852.—January 14th: the thermometer at sunrise stood at 19°, and ice on ponds was from one and one-half to two inches thick; on the 20th the thermometer stood at 6° at sunrise, it was the coldest night since February, 1835. The thermometer at sunrise on the 21st was 24°; on the 22d, 22°; on the 23d, 18°; on the 24th, 27°; and on the 25th, 24°.

1853.—In January there was a slight freeze, but ice did not form much over half an inch thick and no more ice formed that winter.

1854–55.—The ice at no time during the winter of these years was thick

enough to collect. After an uncommonly long continuance of dry weather (there being an uninterrupted drought of more than three months), the weather began to change about the middle of December and continued changeable to the end of the year; on Christmas evening there was a thunder-storm, and on the 29th there was a heavy fall of rain, with thunder and lightning.

1856.—January 4th: the thermometer stood during the day at 36°, the weather was very cloudy and the wind northeast; after sunset the temperature fell to 30° and the rain and sleet began to fall, which increased as the night advanced, and loaded the trees everywhere with a weight of ice too thick for them to bear and many branches were broken off; the sleet continued to fall until late on the morning of the 5th; the limbs of trees were breaking and falling in every direction during the whole of the 5th, and until the morning of the 6th, the scene of devastation presented was never before witnessed by the oldest inhabitants of the country; on Thursday, January 10th, the temperature was 17°, and ice nearly an inch thick; on the 11th the thermometer stood at 19°; on the 12th more sleet fell, and on Sunday (13th) the trees were again covered with ice, presenting the same brilliant appearance as on the 6th. On Wednesday, the 23d, the temperature was 14°, and the weather clear and bright; the thermometer on the 24th recorded 17°; on the 25th, 24°; on the 26th, 28°; on the 27th 29°; on the 28th, 27°, and on the 29th, 24°. On the 26th there was some snow, and occasionally throughout the day, sleet; during the night there was a heavy fall of sleet, which covered the trees and ground with ice; on Monday (28th) the sun rose clear, and shone brightly, kindling up millions of the most brilliant diamonds of every hue over the whole face of the country, which were soon liquified. On the 29th ponds were covered with ice from two to four inches thick which had been forming for the past week; on the 30th the thermometer was 26°, and the weather clear; 31st, thermometer 24°, and the ground frozen hard; this was the coldest January ever experienced by the oldest inhabitants of this country; there has been in some years one or two colder days, but never, in the remembrance of any one, such a long continuance of freezing weather.

1857.—January 13th: ice two inches thick was gathered for ice-houses; on the 18th it began to rain about 3 a. m. and continued until 9 a. m. when it began to sleet, which at 10 a. m. turned to snow, the temperature having fallen to 32°, the wind being from the northeast; the snow continued steadily all day with strong north and northeast winds, the thermometer falling from three to four degrees every hour until 4 p. m., when it stood at 12°; the snow at sunset was three or four inches deep; the ground not being frozen when the snow began the most that fell in the beginning melted; on the 19th the thermometer stood at 8°, and ice on the ponds was nearly two inches thick, which on the 22d had increased to four inches; there was a very little abatement in

the cold on the 24th, ice on ponds was five inches thick and the ground was frozen seven or eight inches deep by actual measurement; this January was colder than even the last. The thermometer at sunrise of the 19th was 8°, and at 3 p. m. 22°; on the 20th it stood at 13° and 32° at the same hours; 21st, 32° and 35°; 22d, 14° and 28°; 23d, 13° and 23°; 24th, 20° and 35°.

The following summary will show approximately the difference between the mean temperature of January 1857 and 1886:

1857.			1886.				
	Sunrise.	3 p. m.	7 a. m.	2 p. m.	Monthly mean.	Max.	Min.
Monthly mean.....	28.9	39.3	33.4	43.9	39.0	45.4	32.1

The following table shows the temperature of the seven coldest consecutive days in 1857 and 1886:

1857.			1886.					
Date.	Sunrise.	3 p. m.	Date.	7 a. m.	2 p. m.	Daily mean.	Max.	Min.
	o	o		o	o	o	o	o
18.....	36.0	13.0	9.....	20.0	21.0	17.8	22.0	15.0
19.....	8.0	22.0	10.....	10.0	22.0	17.0	24.0	10.0
20.....	13.0	32.0	11.....	8.0	17.0	12.8	17.0	8.0
21.....	32.0	35.0	12.....	6.0	21.0	17.2	23.0	6.0
22.....	14.0	28.0	13.....	9.0	30.0	21.8	31.0	9.0
23.....	13.0	23.0	14.....	15.0	35.0	26.5	35.0	15.0
24.....	20.0	35.0	15.....	23.0	43.0	36.0	43.0	23.0
Mean.....	19.4	26.9		13.0	27.0	21.3	29.7	12.3

The mean temperature for January, 1886, 39°.0, is 5°.1 below the average for the past five years.

ERRATUM.

On page 300 in the REVIEW for December, 1885, in the table "Deviations from normal temperatures," Webster, Day county, Dakota, instead of the data as given, read: 12°.8, 3, 23°.2, +10.4.

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32.1

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Min.

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10.0

8.0

6.0

9.0

15.0

23.0

12.3

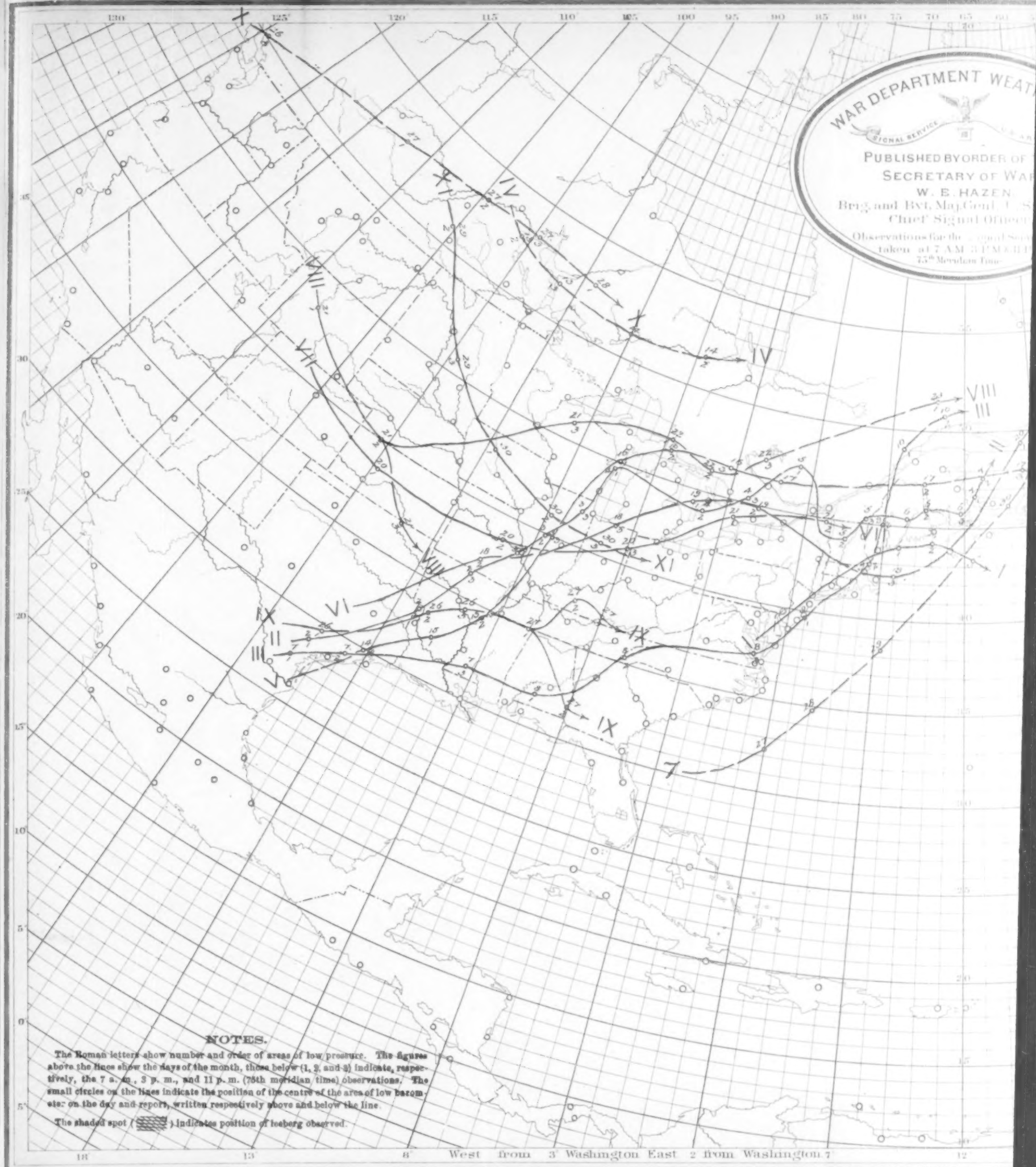
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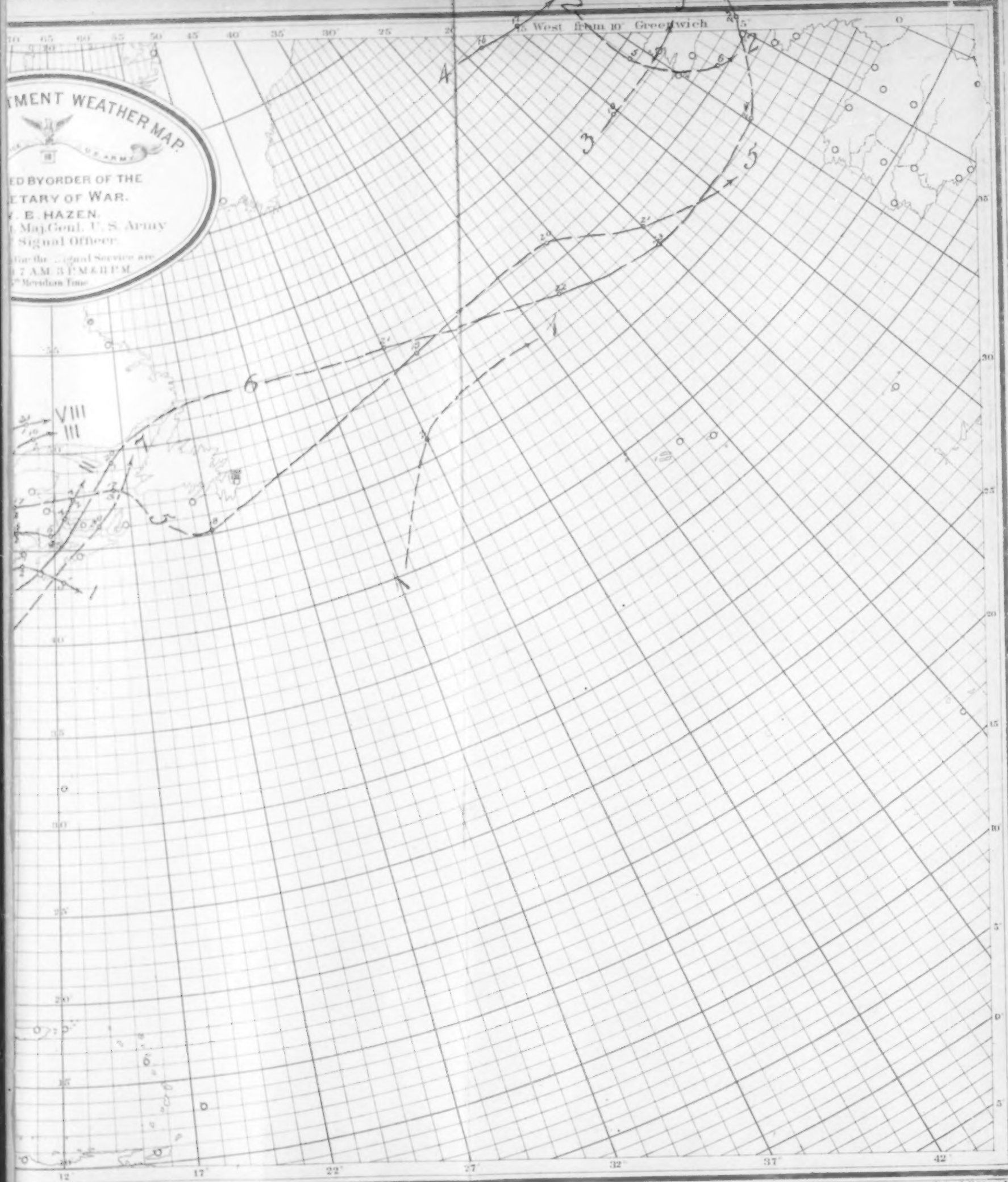
0.2,

WAR DEPARTMENT WEATHER
SIGNAL SERVICE
PUBLISHED BY ORDER OF
SECRETARY OF WAR
W. B. HAZEN
Brig. and Bvt. Maj. Genl. U. S. A.
Chief Signal Officer
Observations for the month of Sept.
taken at 7 A.M. 3 P.M. 11 P.M.
75th Meridian Time



18 West from 3 Washington East 2 from Washington 7 12

Low Pressure. January, 1888.





Signal Office Lith.

Chart III. Precipitation, January, 1886.

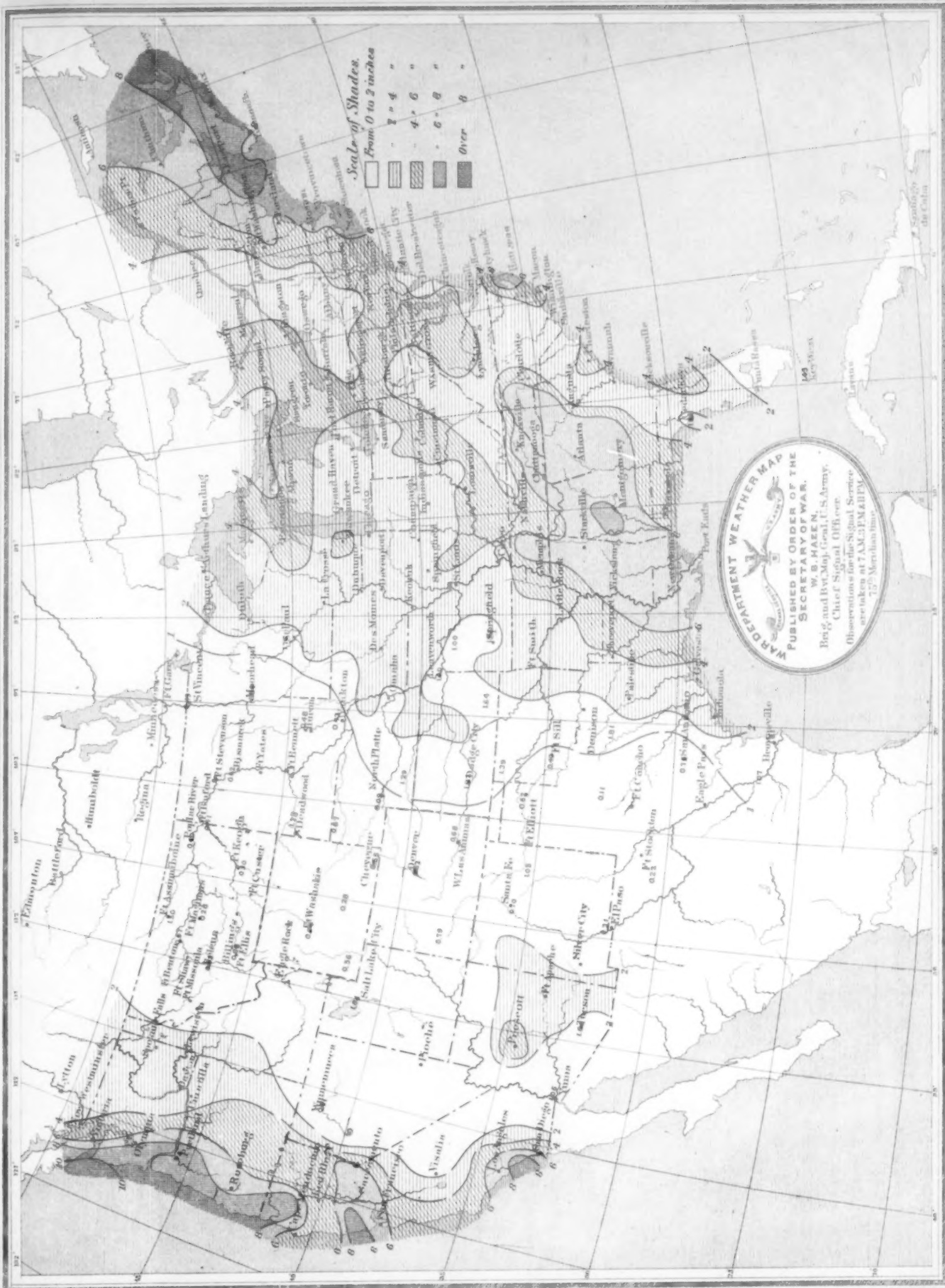
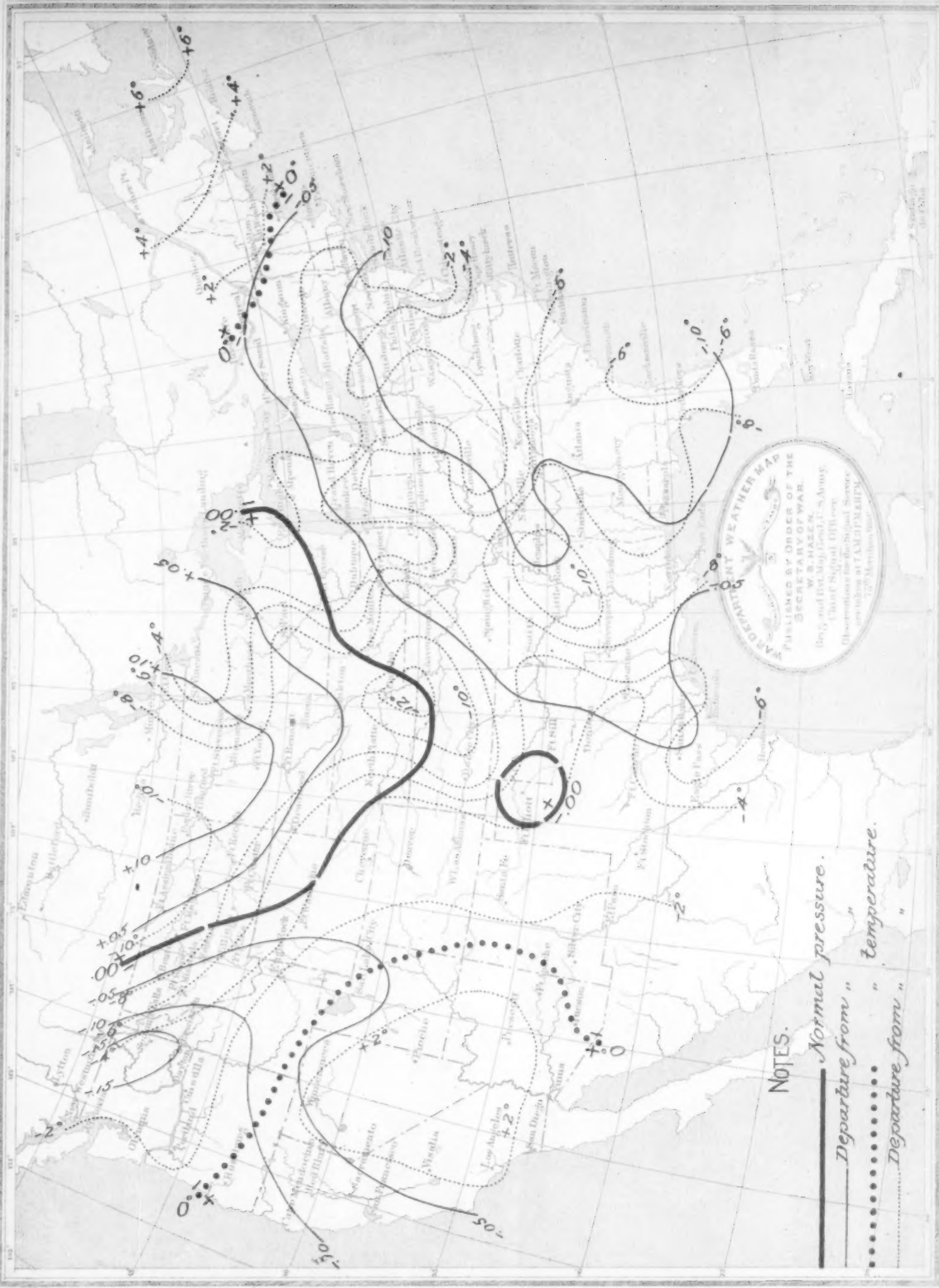


Chart IV. Departures from Normal Atmospheric Pressure and Temperature. January, 1886.

FORM 106 F.



NOTES.

— Normal pressure.

..... Departure from " "

..... Departure from " "

..... temperature.

..... Departure from " "

Vol. 11

[illegible]

Observer and place of observation.	Observer and place of observation.	Observer and place of observation.	Observer and place of observation.
Adams, Effie, Logan, Iowa.	Dunton, Lieut. W. R., Dorset, Vt.	King, W. R., Yellow Springs, Ohio.	Strong, S. B., Staunton, N. Y.
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Day, Theodore, Dyberry, Pa.			
Dawson, Wm., Spiceland, Ind.			
Davis, W. O., Bloomington, Ill.			

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Alabama State Weather Service, under direction of Prof. P. H. Mell, Jr., Auburn, Alabama.
 Illinois Weather Service, under direction of Mr. Charles F. Mills, Springfield, Illinois.
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 Ohio State Weather Service, under direction of Prof. B. F. Thomas, of the Ohio State University, Columbus, Ohio.
 Tennessee State Weather Service, under direction of Major H. O. Rife, Nashville, Tennessee.
 Data have also been used from meteorological records of the Central Pacific and Southern Pacific railway companies.

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Flags for the display of Weather and Temperature signals, in sets of six, may be obtained for—

\$15 from M. G. Copeland & Co., No. 634 Louisiana Avenue, Washington, D. C. (standard bunting);

\$15 from Crane & Co., McWhorter and Oliver Streets Newark, New Jersey;

\$15 from C. S. Decker, No. 168 State Street, Boston, Massachusetts;

\$15 from Hörstmann Bros. & Co., Fifth and Cherry Streets, Philadelphia, Pennsylvania, ("Eagle" bunting);

\$15 from John F. McHugh, No. 1286 Broadway, New York City.

Correspondence in relation to these flags should be had direct with the above firms and not through this office.

Any of the above-enumerated instruments, apparatus, etc., may be obtained at the prices named, with such *additional cost* of packing and shipping as is shown opposite the items respectively. The charges for expressage are to Washington, D. C., and for other distances will be the actual charges of express companies.

The office will be pleased to procure any of the articles, upon the receipt of their money value, including charges for packing and shipping, but all remittances by draft, money-order, or postal note should be made payable to the parties furnishing the articles desired. In case of money-orders state plainly to whom made payable, but send them in a separate letter. If requested by the parties ordering instruments, a comparison will be made with the standards in this office before forwarding, but, if not, they can be ordered direct, by reference to price list furnished from this office, except those furnished by Henry J. Green, successor to Messrs. J. & H. J. Green, which should always be ordered through this office. Purchasers must assume all risks of breakage when ordering instruments through this office. Postage stamps cannot be received as money.

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